JULY 16, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

Microwave Antennas at Snohomish

IN THIS ISSUE

AIEE Summer Meeting

Dentistry Saves Poles

Power Salesman and Defense

GIVE YOUR TURBINES "ADDED" PROTECTION

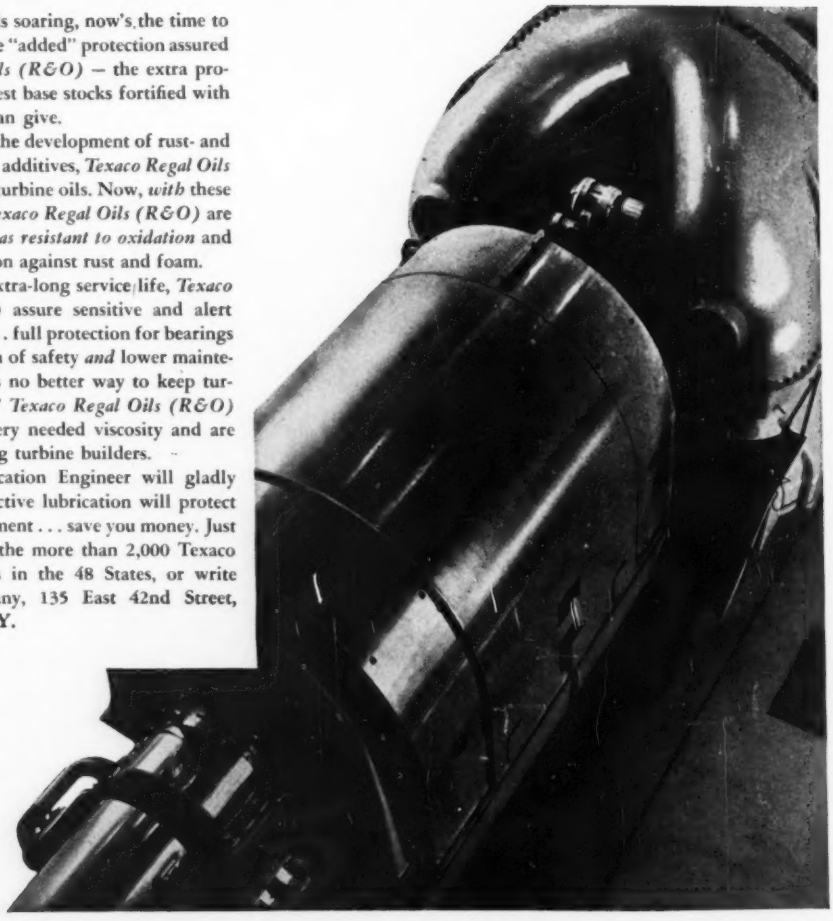
Lubricate with TEXACO REGAL OILS (R&O)

With power demands soaring, now's the time to give your turbines the "added" protection assured by *Texaco Regal Oils (R&O)* — the extra protection that only finest base stocks fortified with superior additives can give.

For years, before the development of rust- and oxidation-inhibiting additives, *Texaco Regal Oils* were world-famous turbine oils. Now, *with* these special inhibitors, *Texaco Regal Oils (R&O)* are *more than 10 times as resistant to oxidation* and give added protection against rust and foam.

Throughout an extra-long service life, *Texaco Regal Oils (R&O)* assure sensitive and alert governor reaction . . . full protection for bearings . . . a greater margin of safety *and* lower maintenance costs. There's no better way to keep turbines "on the line." *Texaco Regal Oils (R&O)* are available in every needed viscosity and are approved by leading turbine builders.

A Texaco Lubrication Engineer will gladly show you how effective lubrication will protect your turbine investment . . . save you money. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

NOTES ABOUT THIS ISSUE

Everybody in the utility business who has anything to do with communications and controls is talking enthusiastically about microwave. Its many champions point out that it is not restricted to conductors; so it is not, like carrier current, at the mercy of ice and wind storms.

But so far, nobody has compared carrier current against microwave in the cool and calculating light of economics. Taking all possible factors into consideration, which will give you the most for your money?

F. C. Krings, of G.E. applies the economics yardstick to both methods, in this issue. If you have anything to do with communications and controls you'll want to know what he decided.

NETWORK CONNECTIONS

Kansas City has a new downtown low-voltage network system which has been installed in progressive steps since 1946. Kansas City Power & Light recently completed new connections to downtown office buildings, and engineer Richard Rice tells a story of value to every distribution man about making customer service as modern as a big city network.

CAVITIES IN POLES

It was seven years ago, more or less, that B. J. Barmack of Commonwealth Edison became interested in making the tops of poles last longer.

He had seen all the attention given to pole bases, so he decided to experiment in finding a way to make the tops last as long as the butts.

His early efforts made an article which appeared in Electrical World on Dec. 23, 1944. Since then he has worked diligently on his pet problem, and come up with some valuable answers. He uses a mixture of flyash and pentachlorophenol to fill pole top cavities—stops rot and adds life and usefulness.

HELPING HAND

The new economy has changed the utility power salesman's job. He has become an information center, among the industries in his field, on defense contracts and sub-contracts. Clarence Shoch, of Pennsylvania Power & Light, lists ten points in a salient check list to show how power salesmen can help their industry customers in the defense program.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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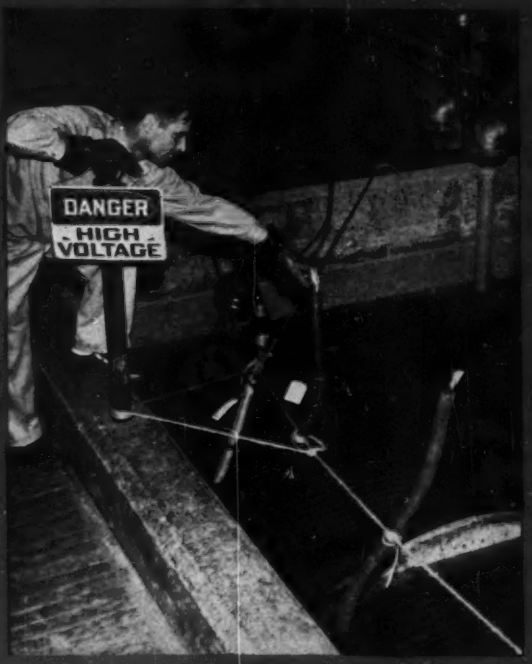
THIS SUPER-VOLTAGE TESTING OF OKOLITE-OKOPRENE assures lasting circuit security



There is one reason why:

In any cable, tiny and hidden imperfections may not show up at ordinarily-specified test voltages. In actual service, such imperfections can be most treacherous since at normal operating voltage they may not result in dielectric breakdown for several years. Only by the use of super-voltages, both a-c and d-c, are such concealed defects disclosed.

Okonite super-voltage testing is the severest in the industry. For example, Okolite-Okoprene non-shielded 5000-volt cables are first tested at a-c voltages approximately 25% greater than called for by standard specifications. Then, in addition, Okonite applies d-c tests at least *three times as high* and for periods *three times as long* as these super-voltage a-c tests. Ordinary cables are not subjected to such tests because they do not possess that extra margin of dielectric strength that Okolite-Okoprene provides. Only a cable made with premium materials and the exclusive Okonite strip process can reliably pass such tests.

Without exception, Okonite applies these self-imposed super-voltage tests to *every foot* of *all* Okolite-Okoprene cables for *all* voltage ranges—and after 12 hours immersion in water. That's why, when you specify Okolite-Okoprene cables, you can be sure of uninterrupted, trouble-free service—lasting circuit security—year after year after year. The Okonite Company, Passaic, N. J.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*

8554

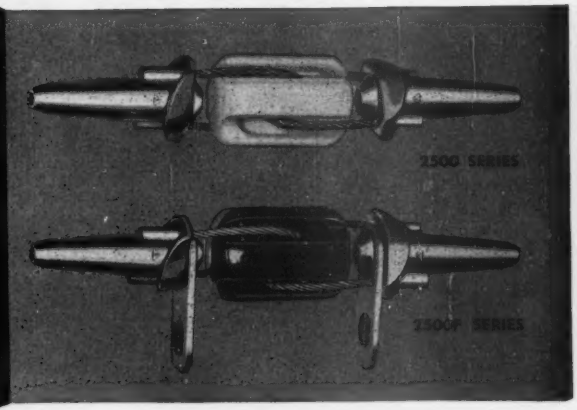
for the largest number of line applications at the lowest possible cost...

USE

Electroline

Insulating
Automatic
Line Splice

SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

These Insulating Automatic Line Splice Sectionalizers are ideal for:

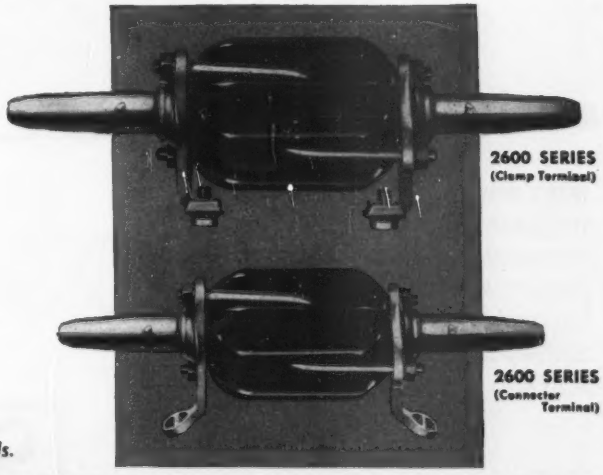
Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.

Send for Bulletins containing complete details.



TALENT TO ORIGINATE
E
ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois
In Canada: POWERLITE DEVICES, LTD., TORONTO

NEW LOW COST

BREAKS ANY CHARGING CURRENT AND

THE TIME-TESTED ALDUTI INTERRUPTER SWITCH AT CONVENTIONAL AIR BREAK SWITCH PRICES

Since 1939 the reliability of the solid-material confined-arc extinction method of high voltage circuit interruption illustrated below has been proved under actual service conditions in thousands of installations for switching full rated load currents, line- and cable-charging currents, and magnetizing currents.

This circuit interrupting principle is now available in group-operated arrangements for pole-top switching at prices that compare with horn gap switches.

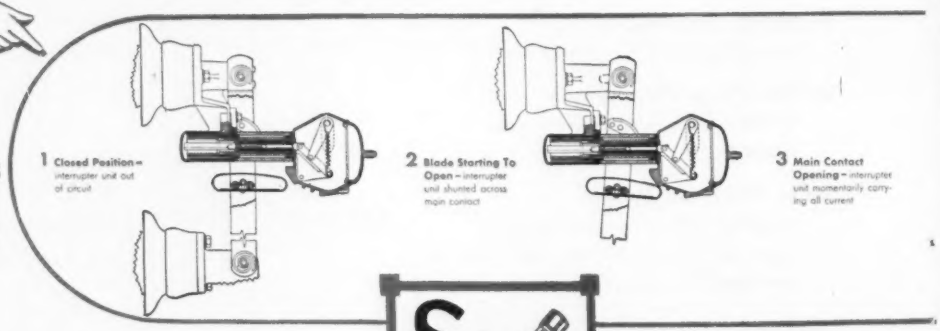
Because there is no external arc, this interrupter switch can be inverted, or mounted vertically, for simple installation and maintenance.

Further, because there is no external arc, the cost-saving side-opening design pictured here actually requires less phase spacing than a horn gap switch.

• • •

Full details are available from your local S&C representative, or the factory.

HERE'S HOW THE ALDUTI INTERRUPTER UNIT OPERATES TO PROVIDE CONFINED-ARC SWITCHING


1 Closed Position – interrupter unit out of circuit
2 Blade Starting To Open – interrupter unit shunted across main contact
3 Main Contact Opening – interrupter unit momentarily carrying all current

S&C ELECTRIC

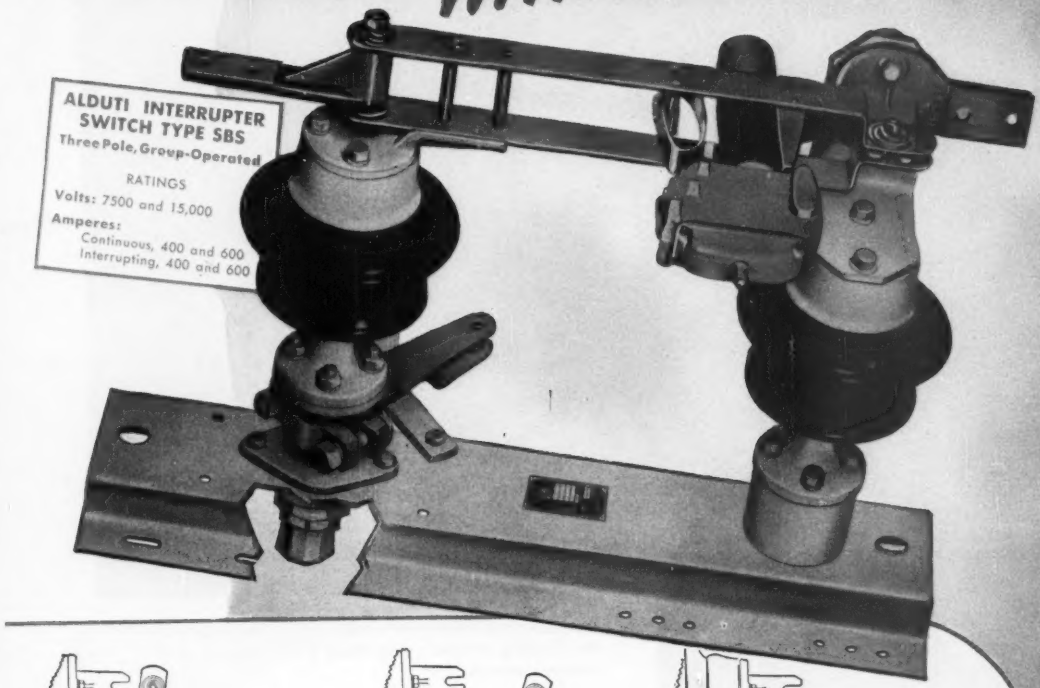
Formerly SCHWEITZER & CONRAD, INC.

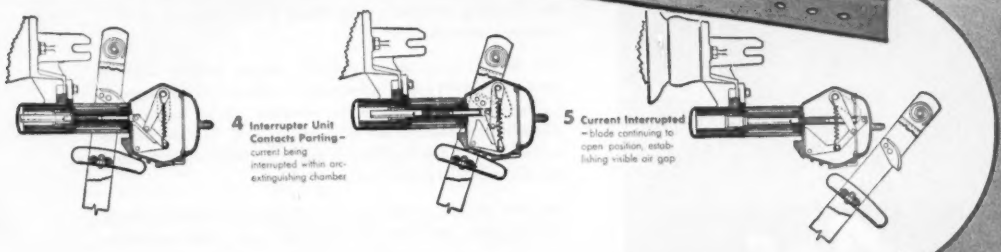
POLE TOP SWITCH

FULL LOAD CURRENT *WITHOUT ARCING!*

ALDUTI INTERRUPTER SWITCH TYPE SBS
Three Pole, Group-Operated

RATINGS
Volts: 7500 and 15,000
Amperes:
Continuous, 400 and 600
Interrupting, 400 and 600





4 Interrupter Unit Contacts Parting— current being interrupted within arc-extinguishing chamber

5 Current Interrupted—blade continuing to open position, establishing visible air gap

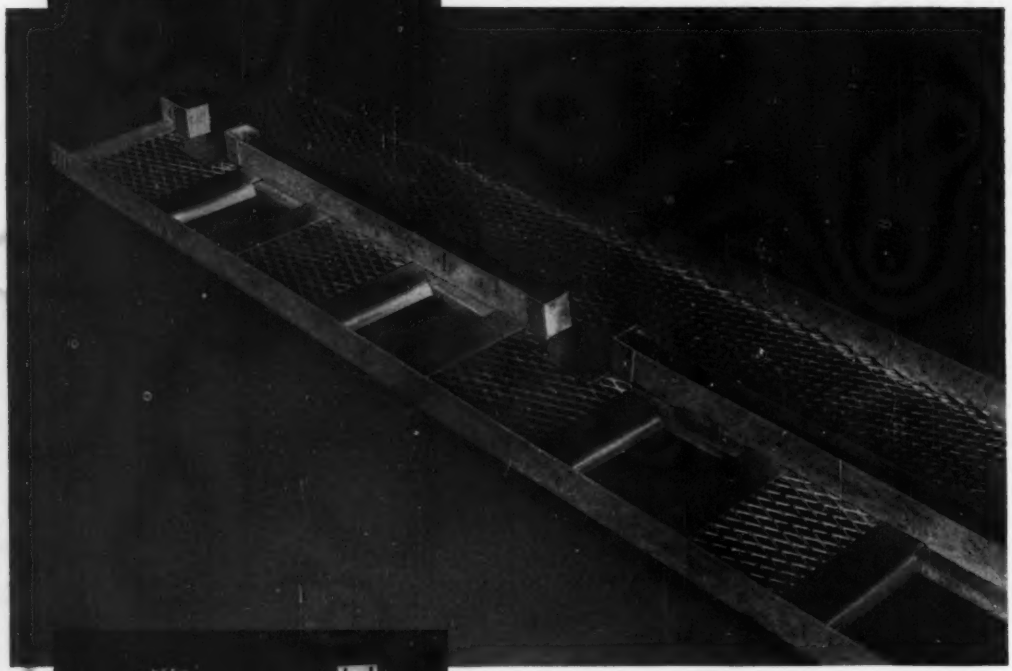
COMPANY

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada, Powerlite Devices, Limited, Toronto

This message is for you...

HAVING UNUSUAL PROBLEMS WHICH REQUIRE SPECIAL DESIGNS OF CABLE TROUGH



T.J. Cope INC.

YOU KNOW COPE BY THESE PRODUCTS

There are many cases where installation of cable trough creates this "puzzling problem": *How* should it be designed to fit a particular situation?

That needn't cause you any worry, though, because Cope is solving such individual problems daily. Where a Design Engineer is concerned over a "perplexing situation", all he has to do is outline the problem to our Engineering Staff, and the solution comes from us. Cope Engineers design special fittings which adapt the standard Troughs to your specified job.

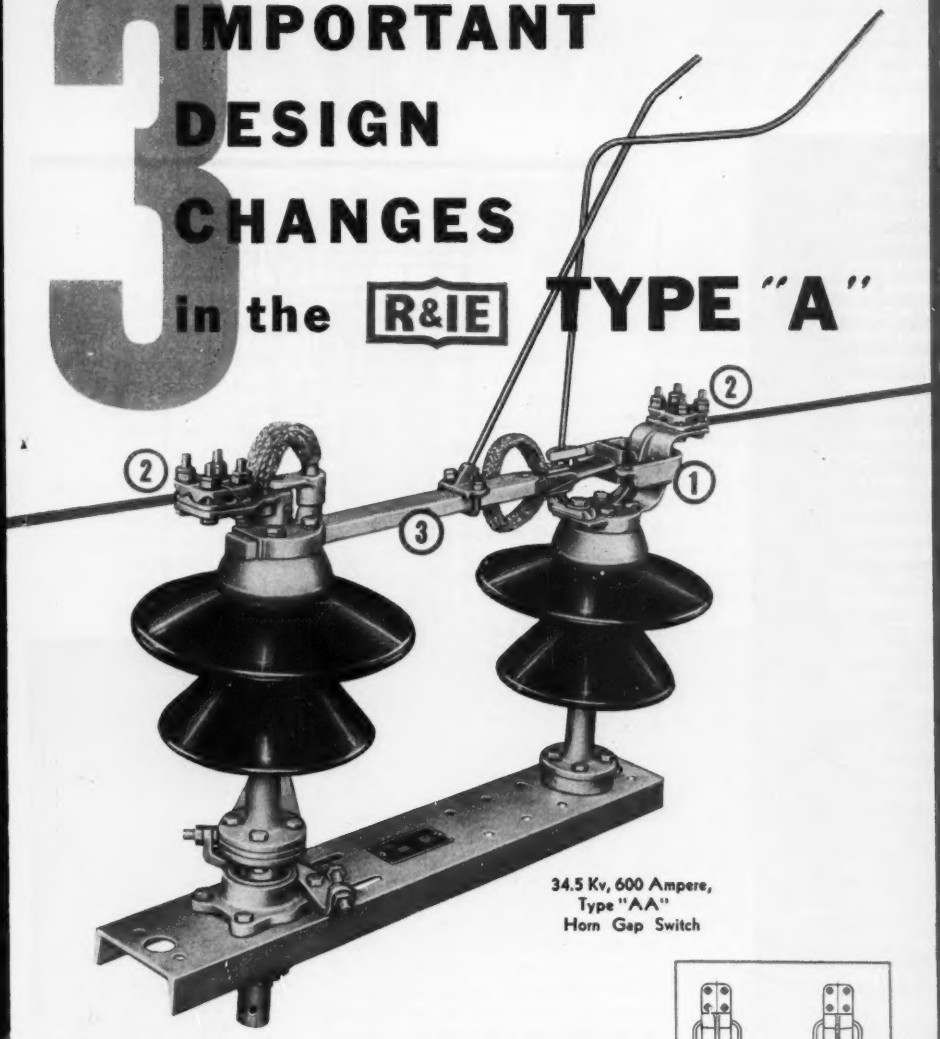
We offer you the services of our Engineers when special fittings are required, and urge you to submit your problems to us.

You will quickly discover—as have hundreds of users—that the new Cope Cable Trough with its simplified design actually saves you *three ways*: material, labor and costs.

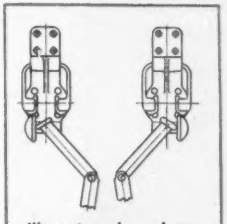
Request full information on Cope Cable Trough from us today.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA

3 IMPORTANT DESIGN CHANGES in the R&IE TYPE "A"



34.5 Kv, 600 Ampere,
Type "AA"
Horn Gap Switch



Illustrations above show: Left, clockwise operation; Right, counter-clockwise operation.

1. Hi-Thermal capacity, silver-to-copper contact. A sliding, wiping action makes a new, clean surface with each contact operation. Copper and beryllium jaw - copper for thermal capacity and beryllium for strength and resiliency.
2. Terminals at the same level from base - for straight-line bus connections. (Universal Terminal Clamps, 600 or 1200 amperes, mount with 4 half-inch bolts on 1¾" centers).
3. Reversible blade and jaw permit clockwise or counter-clockwise operation.

Other Important Features include:

Greaseless, weather-proof, stainless-ball bearing; — Rigid steel channel base; — Generous clearances at operating crank and jaw prevents ice-locking.

Where could you get more?

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.
IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO
AN I-T-E SUBSIDIARY

The Quick List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

TIDD
JENNISON
CECIL LYNCH
HAVANA
MEREDOSIA
PERMIAN BASIN
O. H. HUTCHINGS
REX BROWN
HICKLING
B. C. COBB
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POSSUM POINT
PORT JEFFERSON
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GADSDEN
POTOMAC RIVER
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WOOD RIVER
LAKE CATHERINE
HARRY NEWMAN
DAN RIVER
JIM HILL
HUTCHINSON
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA

HAWTHORN

NINEMILE POINT
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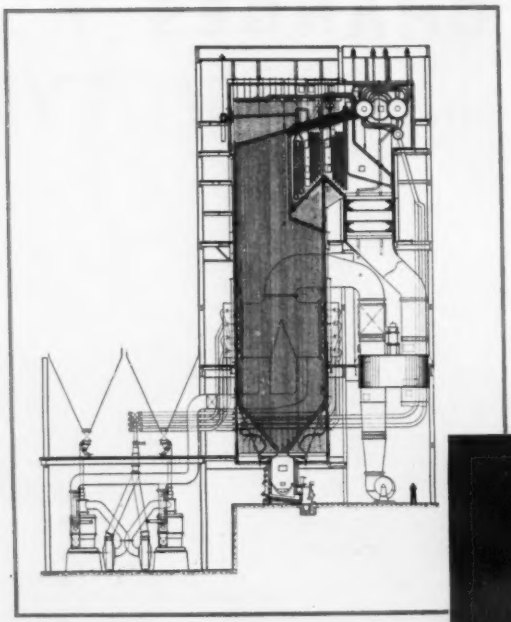
NEW



The cross-sectional view above shows one of the two duplicate C-E units which comprise the first section of the Hawthorn Station. They are radiant type units with 3-stage superheaters and finned tube economizers in the last pass. Regenerative type air preheaters follow the economizer surface. These units are designed for pulverized coal firing using bowl mills and tilting, tangential burners. Natural gas will be employed as an alternate fuel. Each unit is designed to produce 625,000 lb steam per hr at 1335 psi and 955F.

C-E

COMBUSTION

200 MADISON AVENUE, NEW YORK 16, N. Y.

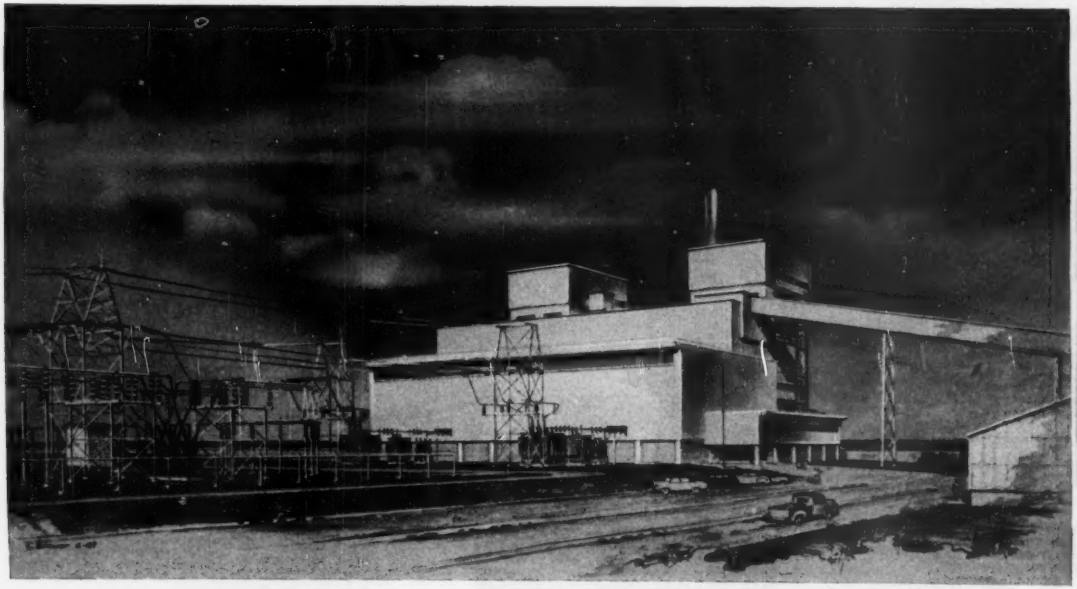
Hawthorn Station — goes into service

Providing 40 per cent more electric power to meet the growing needs of the Kansas City area, the initial 132,000 kw section of the new Hawthorn Station of Kansas City Power & Light Company will be in operation by September 1951. The first of two 60/66,000 kw units was placed in operation in May.

An additional 90/99,000 kw reheat unit has also been ordered and scheduled for service late in 1952. Upon completion of these units the Hawthorn Station will have a total capacity of 231,000 kw and the Company's total generating capacity will have been increased by more than 100 per cent since 1941.

Located on the Missouri River in the Northeast Industrial District of Kansas City, Missouri, this fine, modern plant will supply more abundant electric service for thousands of homes and farms, as well as the rapidly expanding industry and commerce in twenty counties of Missouri and Kansas. Hawthorn Station was designed, engineered and constructed by Ebasco Services, Inc. of New York.

C-E Steam Generating Units, the first of which is illustrated in cross section and briefly described on the opposite page, will serve all of the turbine generators mentioned above. B-504

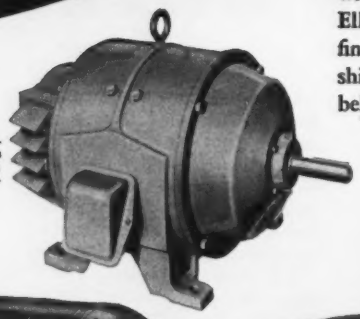


ENGINEERING—SUPERHEATER, INC.

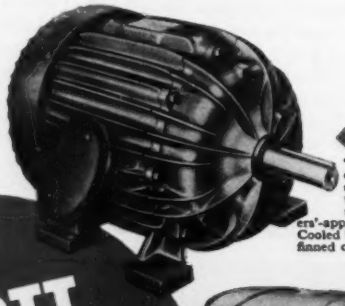
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

In motors from 1 hp up you're a step

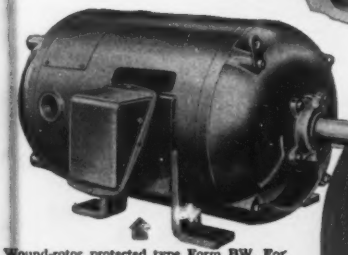
Looking for a dependable motor in any standard type, 1 hp or larger? You'll find it in this complete line, with the backing of the Crocker-Wheeler name plus the Elliott name—double assurance that you're getting as fine a motor as skilled engineering and veteran workmanship can turn out... Some representative types shown below. Write for bulletins.



DC dripproof and dripproof-protected types Form F, in ratings to 7½ hp. Form H, 10 to 200 hp.

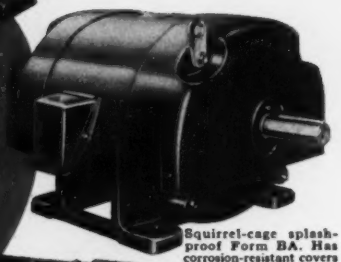


"Sealedpower" totally-enclosed fan-cooled squirrel-cage motors, 3 to 125 hp. Also explosion-proof underwriters'-approved, 20 to 125 hp. Cooled by air blown along the finned outer case.

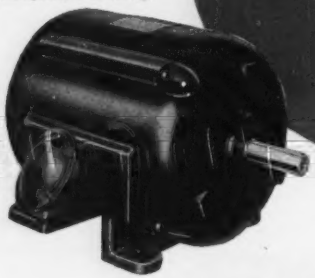


Wound-rotor protected type Form BW. For slow, smooth acceleration, high starting torque with low starting current, or variable speed. Drip-proof, splash-proof, 1 to 200 hp.

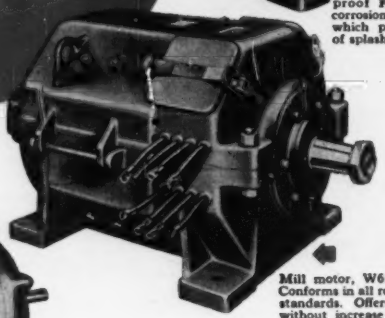
ELLIOTT
CROCKER-WHEELER
Integral
motors



Squirrel-cage splash-proof Form BA. Has corrosion-resistant covers which prevent entrance of splashing liquids.

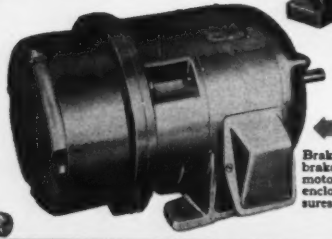


Squirrel-cage, totally-enclosed, non-ventilated Form BE. Available up to and including 3 hp at 1800 rpm, for applications requiring protection against dust, fumes, moisture.



Mill motor, W600 Series, DC. Conforms in all respects to AISE standards. Offers more power without increase in frame size.

Squirrel-cage protected type Form BA. An open dripproof motor for general purpose use. Available in wide modifications to meet a variety of conditions.



Brake motor using latest disk type brake mounted on BA dripproof motor. Also available with totally enclosed and splashproof enclosures for AC or DC applications.

HALF CENTURY OF 1901 E 1951 POWER PROGRESS

ELLIOTT

Crocker-Wheeler Division—Ampere, N. J.

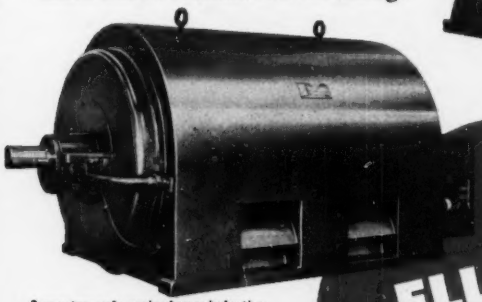
DISTRICT OFFICES IN PRINCIPAL CITIES

ahead with ELLIOTT

Looking for a really big motor—big in quality as well as capacity? These fine Elliott motors have the exceptional strength and rigidity of welded steel construction in frame and spider with a number of other notable advantages. Fabri-steel construction marks the greatest advance in large motor design and construction since the turn of the century. Some of these outstanding motors are illustrated below. Bulletins for the asking.

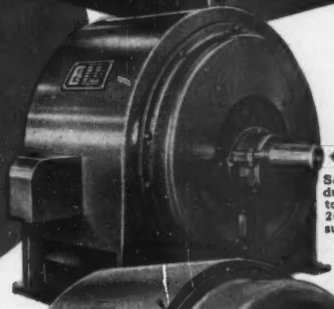
Synchronous motor for gas compressor drive. Available with solid or split rotors, open or enclosed, engine type or coupled type, rigid construction.

Totally-enclosed fan-cooled motor, cooled by heat exchanger located at top of unit. Two-pole ratings 300 to 4000 hp. For lower speeds, sizes equivalent to 50-hp, 14-pole, to 3000-hp, four-pole.

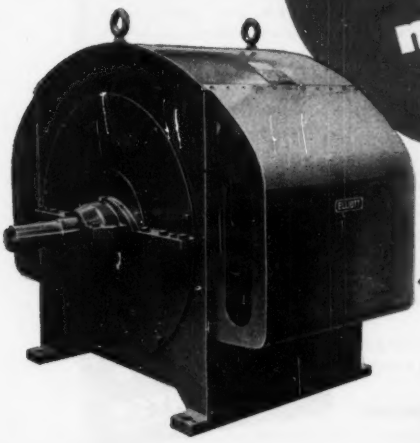


Large two-pole squirrel cage induction motor (350 hp up). A long forward step in two-pole design. Typical Elliott welded steel construction enables widest variation in type of enclosure.

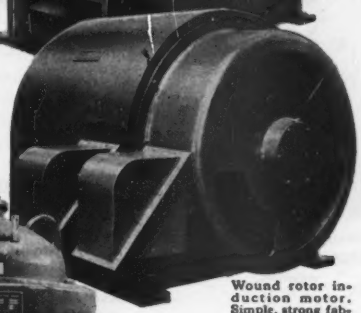
ELLIOTT large motors



Squirrel-cage induction motor, four to 14 poles, 150 to 2000 hp. All enclosure types.



Outdoor splashproof squirrel-cage induction motor especially designed for outdoor installation without protective covering. 150 hp, 14 pole to 2000 hp, four-pole. 300 hp to 1000 hp two-pole.



Wound rotor induction motor. Simple, strong fabricated construction, sleeve or anti-friction bearings. Available in all types of enclosure.

Vertical outdoor splashproof squirrel-cage induction motor. Can also be made in open dripproof or indoor splashproof with minor changes in ventilating baffles.

L-809

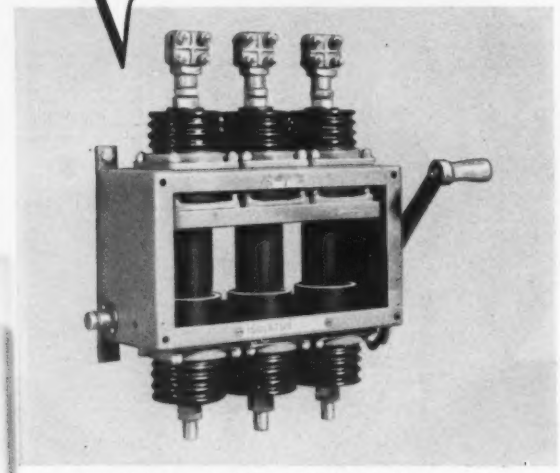
COMPANY

DEPT. 28

Ridgway Division—Ridgway, Pa.

DISTRICT OFFICES IN PRINCIPAL CITIES

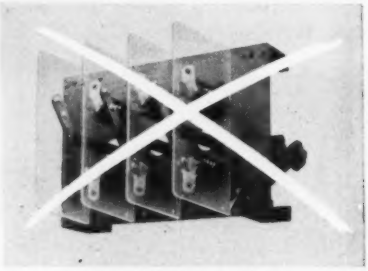
DISCONNECT HIGH-VOLTAGE APPARATUS THE MODERN WAY



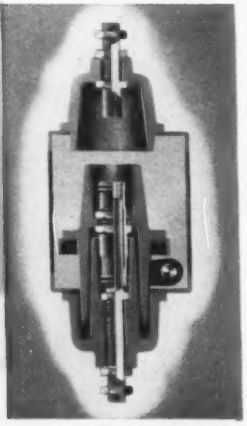
3.P.S.T. 600 ampere 7500 volt ISOLATOR with clamp type terminals on upper studs.

Loads can still be hauled by a horse and wagon, but it's rarely done anymore.

Likewise high voltage apparatus can still be disconnected using blade type disconnects, but the Three E ISOLATOR provides a better way.



3.P.S.T. 600 ampere 7500 volt blade type disconnect.



Cross sectional view of 400 ampere 5000 volt ISOLATOR in open position.

ISOLATORS *save in these ways.*

1 SPACE

Opened or closed, the ISOLATOR occupies only the space normally allotted for passage of conductors. This is about one half the space required for a similarly rated blade type disconnect.

2 MATERIALS

Insulating barriers, steel for enclosures, bus supports, and jumper connections can be saved by using ISOLATORS.

3 ACCIDENTS

Current paths of the ISOLATOR are enclosed in insulation and terminal connections arranged for easy taping, therefore accidental contact is not possible. Blades and clips of conventional disconnects always present a hazard.

ISOLATORS are built for ampere ratings to 2000 and for voltage ratings to 15000.

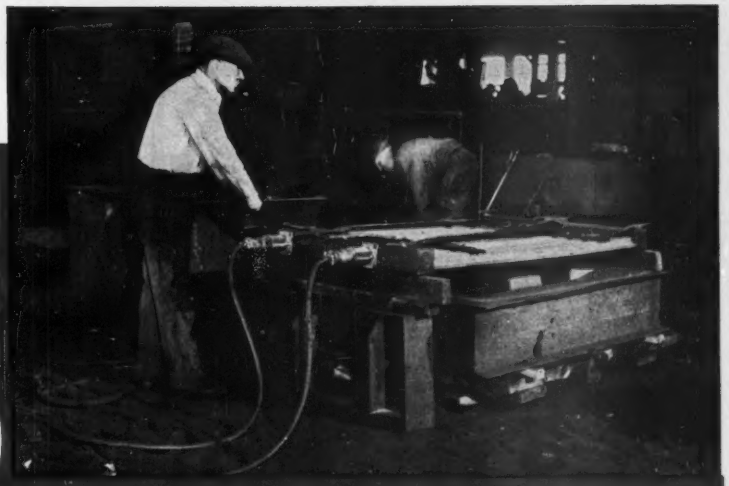
Ask for bulletin 140. It gives the complete ISOLATOR story.

You Can Do It Better With An ISOLATOR

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

TIREX HELPS TAKE THE BUBBLES OUT OF STEEL CASTINGS



Foundries "skin dry" molds so that the molding sand will not give off a gas and cause bubbles or porosity in the casting.

Until a short time ago it was common practice in most foundries to skin dry molds with an open kerosene torch. It was slow, hot, dirty, disagreeable work and a moment's inattention could result in a burned and spoiled mold.

A Milwaukee foundry decided to get rid of this dirty, slow job of skin drying molds. They had infrared ray heaters developed. These heaters not only did away with the drudgery of the job but gave the foundry several unexpected dividends. First, the labor of the man drying the mold was eliminated. Second, spoiled molds became a thing of the past. But better still, because the infrared ray heaters were faster than the open kerosene torches, it was possible to dry an additional mold each day and that is a considerable dividend.

Of course the infrared ray heaters demanded a dependable pathway for power and that they got in TIREX Cables. This picture shows TIREX Cables connected to the heaters. TIREX not only operates dependably day in and day out but it safely combats the sharp abrasive foundry sand, it eliminates the danger from cable fires caused by flying molten metal sparks, and it takes in its stride the everyday abuse that is part of the job.

Isn't that the kind of service that you want from your portable cords or cables? Of course it is! This kind of service was deliberately built into TIREX Cords and Cables. They are a product of Simplex research.

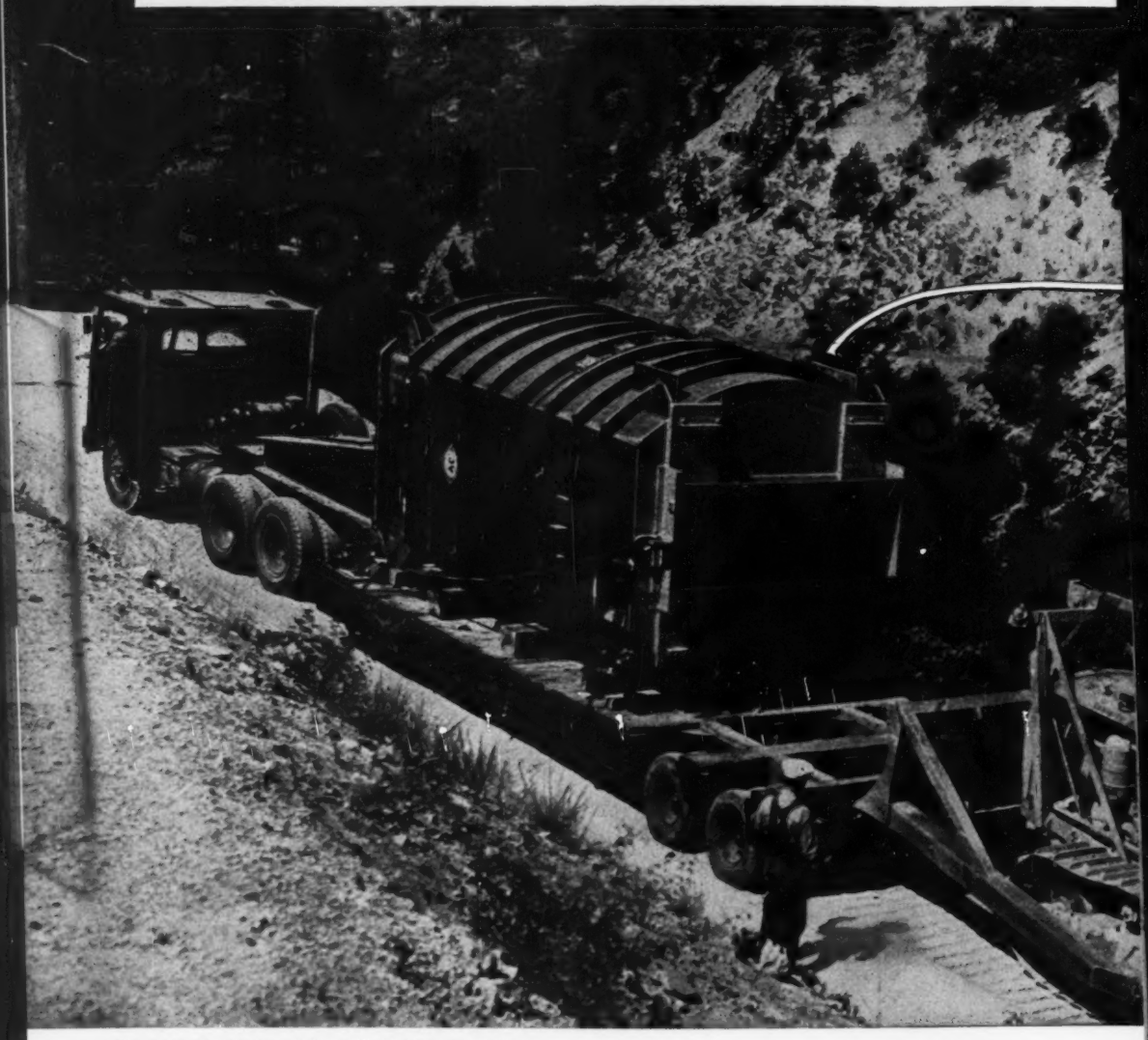
Simplex research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex research has provided a great many developments which have enriched the art of cable design.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

ANOTHER SHIPMENT OF



Shown here is the first of four Allis-Chalmers corona-free transformers being delivered to Pacific Gas and Electric Company's Cresta Power Station in the Sierra Nevada mountains. All four transformers are shell type and are rated 25,000 kva, 240,000/11,500 volts.

ALLIS-CHALMERS

Corona Free TRANSFORMERS

RECENTLY, THE PACIFIC GAS AND ELECTRIC COMPANY boosted the capacity of its transmission system with four Allis-Chalmers corona-free transformers. And because these transformers are free of the destructive effects of corona, they will stay young for years!

Internal corona discharge has been a frequent cause of transformer failure. It shortens transformer life by attacking insulation, causing a gradual weakening of transformer impulse strength.

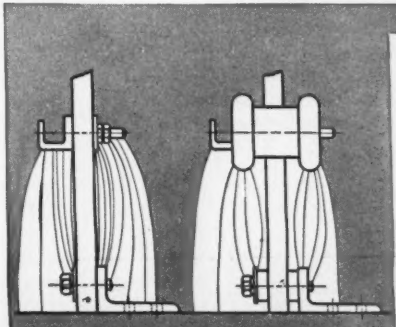
Allis-Chalmers engineers set out to eliminate corona right at the source — sharp corners and other places of high voltage stress. Their oscillograms indicated when and where corona was occurring. By rounding and shielding vulnerable parts of terminal boards and by redirecting dielectric fields, they "knocked out" injurious corona. Then, with the help of calculating boards, they analyzed transient phenomena, thus enabling them to locate critical areas and replace free space with corona-resisting material.

Results: Allis-Chalmers transformers are now completely free of corona. They retain their full impulse strength even after repeated surges from lightning or switching. Allis-Chalmers, Milwaukee 1, Wis.

A-3335

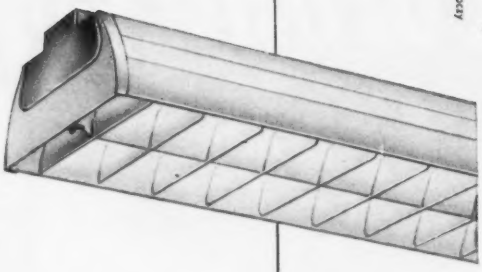
1. CALCULATING BOARD helps engineers solve complex transformer problems and makes possible detailed analysis of transient phenomena. Transformer equivalent circuit is set up on the calculating board for initial voltage measurements. From readings obtained the amount of insulation required at every point in the transformer is determined.

2. IMPULSE WAVE is examined by engineer J. H. Moran during voltage distribution test. Transformers receive a reduced voltage test when partially assembled. Full test voltages are applied to the finished transformer, using the oscilloscope as a further check on calculating board figures. Voltage measurements are carefully checked.



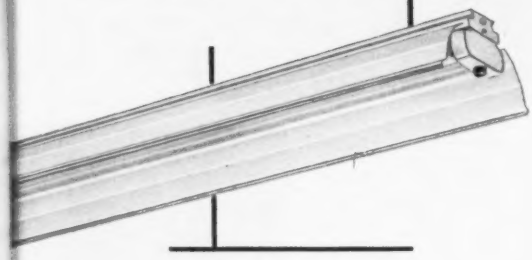
3. Electrodes in immediate contact with an insulating panel submerged in oil tend to develop corona and streamers that flash to ground.

The *before* and *after* sketches shown indicate what has actually been done to make these high voltage units completely safe from stresses. Tap changers can now do their work without danger of breaking down after countless lightning or switching surges have struck the transformer.



Nordin & Radocay

ELEMENTS TO LOOK FOR IN MEASURING LIGHTING FIXTURE VALUES



First and foremost, QUALITY of equipment to assure good lighting performance and long service. Then, engineering features that simplify installation and keep down to a minimum the cost of maintenance. And—important economic consideration—low overall cost (cost of equipment, installation and maintenance). These constitute VALUE—lighting satisfaction. You'll find all these elements in Miller lighting equipment—Fluorescent, Incandescent, and Mercury-vapor—built on an 8-Point QUALITY standard, on a background of 107 years' pioneering and progress in GOOD LIGHTING. Proven by thousands of installations in stores, offices, schools, factories and public buildings, covering a wide range of lighting requirements. Light with confidence the *proven* Miller way. Miller field engineers and distributors are conveniently located for nation-wide service.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment
HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices
ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

LOCKE

presents masterpieces of

insulator engineering

Tens of millions of

LOCKE SUSPENSION INSULATORS

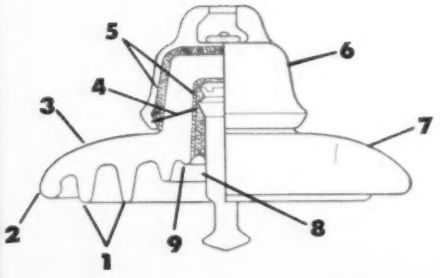
typified by

No. 1840

shown above . . . are in use on the world's high voltage transmission lines, some having been up since 1904. Certainly here is eloquent proof of their superior performance and broad acceptance. Specify them on your system.

Presenting **A MASTERPIECE OF INSULATOR ENGINEERING**

The LOCKE Suspension Insulator



LOCKE DESIGN gives you ALL these advantages

1. The contours of the corrugations are such as to give maximum resistance to mechanical impact consistent with total weight and balanced electrical characteristics. The depth of the corrugations assures full leakage distance and maximum impact values.

2. The heavy, reinforcing bead on the outer edge of the porcelain shell is an additional assurance against chipping.

3. Compression Glaze—a Locke development—assures high resistance to damage from thermal shock or mechanical impact. This means that Locke insulators can be handled faster in construction without danger of chipping or breaking.

4. The insulator arch is formed between the cap edge surface as the abutment and the stepped pin as the keystone. Thus while loaded in tension, the porcelain itself is working in compression and the best characteristics of all materials are utilized.

5. Locke Compression Sand at the cement joints adds to the strength, and the stability of that strength, throughout the life of the insulator.

6. Galvanizing is done by the exclusive Locke Permazinc process—a quality-controlled, double hot-dip method that assures the highest degree of resistance to weathering and corrosion.

7. The uniformly smooth glazed surface assures easy natural cleaning by wind and rain, and aids the insulator in maintaining its originally excellent electrical characteristics.

8. The large diameter of the pin extends beyond the cement line. This assures cement joints of minimum radial thickness, freedom from troubles arising from thick cement joints, and reduces leakage current concentration (with its resulting corrosion hazard) at this point.

9. This small barrier (petticoat) adjacent to the pin reduces leakage streamers and adds to pin life.

10. Since Fred M. Locke made the first wet-process porcelain insulator in 1893, a long list of Locke "firsts" has emerged: the first successful cemented type suspension insulator in 1904; the first switch insulator in 1909; the first radio-freed pin type insulator in 1932, to name but three.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Maryland.

LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

GUY INSULATORS

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The dependable name in Utility Bodies

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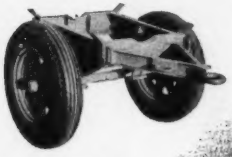
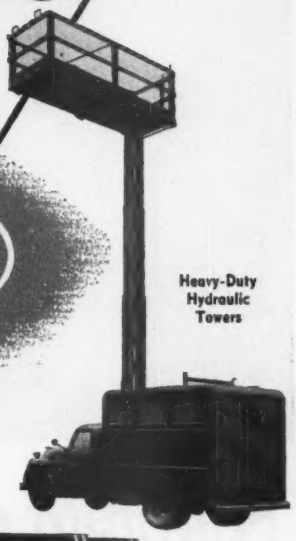
(with or without crew compartments)



Pole Trailers



Heavy-Duty Hydraulic Towers

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Light Line Construction Bodies

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In every competitive field one name stands out among all others. Outstanding features . . . advanced engineering design . . . expert workmanship are the reasons so many utility companies consider Holan the most dependable name in utility bodies.

There is a Holan body for every utility need.

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Along with the entire electrical industry, we are faced with increasing civilian and military demands. We're producing to the limits of our present capacity in order to supply you, and are steadily increasing our facilities so that we may serve you better in the future.

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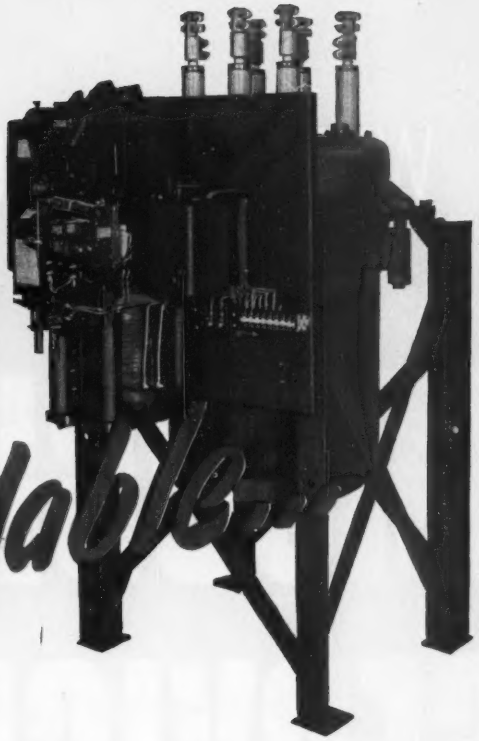
ALLIS-CHALMERS

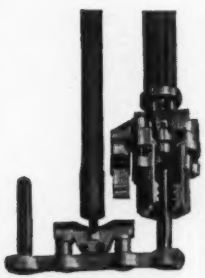
INDUSTRIAL

Oil Circuit Breakers



Dependable

Electrical Protection for Industry



YOU CAN GET full electrical protection for equipment in your plant with the 8-cycle DZ oil circuit breaker. It is liberally and compactly designed to meet your requirements economically.

Mechanically and electrically trip-free, it combines reliability in operation with the advantages of the single break *Ruptor* interrupting device.

The DZ comes in a wide range of ratings. Mounting with framework or for cubicle, solenoid or manual closing, standard operating voltages, all in accordance with ASA standards.

For more information, see your nearby A-C sales office. Or write Allis-Chalmers, Milwaukee 1, Wis. for bulletins 71B6129D (DZ-60B, DZ-100B, DZ-200B) and 71B6179C. (DZ-40B) A-3381

Ruptor is an Allis-Chalmers trademark.

TYPE	RATED K.V.	MINIMUM KV AT RATED KVA	RATED AMPS.	KVA INT. CAPACITY
DZ-40B	7.2	2.3	600	100,000
			1200	100,000
			2000	100,000
DZ-60B	13.8	4.0	600	150,000
			1200	150,000
DZ-100B	13.8	4.0	1200	250,000
DZ-200B	13.8	6.6	1200	500,000
			2000	500,000

The circuit interrupting efficiency of the *Ruptor* arc interrupting device is the result of simple, yet highly effective contact structure. Its effectiveness is proved over many years of service in these and larger power oil circuit breakers.

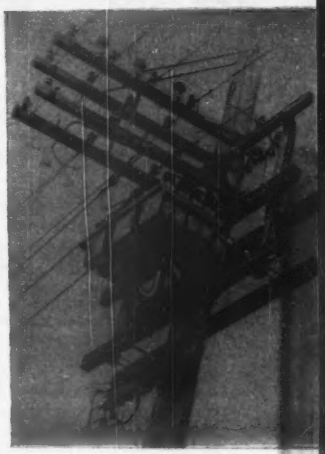
ALLIS-CHALMERS

WEST-COAST UTILITY *reports:*

TROUBLE-FREE SERVICE

FROM ITS C-D CAPACITOR INSTALLATIONS
TOTALLING OVER 155,250 KVAR

Here's another verified C-D field performance record. A large western utility ordered its first C-D capacitors for power-factor improvement back in 1938, and followed this up with many additional C-D installations, totalling over 155,250 Kvar. This utility now reports that these C-D units have given trouble-free service in the field, year after year, with little or no maintenance required. A real tribute to the rugged, money-saving dependability of C-D capacitors!



HERE'S HOW DEPENDABLE SERVICE IS BUILT INTO C-D CAPACITORS:

- Lowest dielectric unit stress
- Highest major insulation level
- Case SAND-BLASTED before spraying, for longer-lasting finish
- Dykanol-filled bushing increases accepted flash-over safety factor
- Lowest volt-amperes per square inch of radiating surface
- Removable solderless connectors
- Many small sections; extremely low voltage gradient per section
- Impregnated and submerged in non-inflammable, non-explosive Dykanol. Results in lower unit weight per Kvar; high stability and longer life

A C-D field engineer will be glad to discuss your power-factor capacitor requirements. Write today for catalog of C-D industrial, station and pole-type capacitors. Cornell-Dubilier Electric Corp., Dept. D-71, South Plainfield, N. J.

CONSISTENTLY DEPENDABLE

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HERE'S THE ANSWER

to your questions about

REYNOLDS ACSR...

Since the Reynolds Metals Company entered the ACSR field, there have arisen some understandable questions concerning the company and its product. Let's look at these questions . . . and the answers to them!

Q. Does Reynolds know the cable business and are they in it to stay?

A. Reynolds has been in the cable business for about 2½ years. In that time we have constructed and put in operation a new multi-million dollar cable plant, with an annual capacity of 50,000,000 pounds of ACSR. Furthermore, we developed and introduced the Master Reel and Coil to eliminate reel handling problems and to cut stringing costs – the first major improvement since the advent of wooden reels. Doesn't that look like we know our business and are in it to stay?

Q. What about the technical qualities of Reynolds ACSR?

A. Thorough testing by men with years of experience assures a conductor of uniformly good quality. For instance, each lot of aluminum is carefully analyzed to insure maximum conductivity . . . steel core properties are controlled by rigid specifications . . . continuous inspection of finished cable minimizes erection and maintenance troubles–assures full strength to meet the most rugged service conditions.

Q. How does Reynolds ACSR compare in cost per mile?

A. Even with the smallest sizes, typical Reynolds ACSR installations save as much as $90.00 per mile – sometimes even more. Because ACSR weighs less than other types of cable in electrically equivalent sizes, fewer poles per mile are required and stringing is faster.

Q. Can we depend on Reynolds for supply?

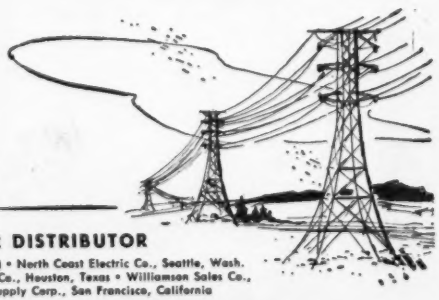
A. Because *all* of Reynolds' facilities–from bauxite to the finished ACSR–are completely integrated . . . and because Reynolds has embarked on a huge new expansion program that assures a production capacity of 650 million pounds of aluminum by 1952 . . . you can depend on Reynolds for your ACSR, if government regulations will permit.

Q. Does the Reynolds man who sells me know his business?

A. Every Reynolds salesman is qualified in the field in which he sells. He brings you the necessary experience and show-how. And behind him, ready to offer you *complete* planning assistance, is the trained staff of Reynolds Technical Service.

Q. How can we get complete information on Reynolds ACSR–sag and tension data, for instance?

A. Send today for your free copy of Reynolds' "ACSR Manual for Engineers." Contains helpful information, complete charts and tables in a loose-leaf binder. Additional data will be sent you whenever new information is available. Write on business letterhead to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.



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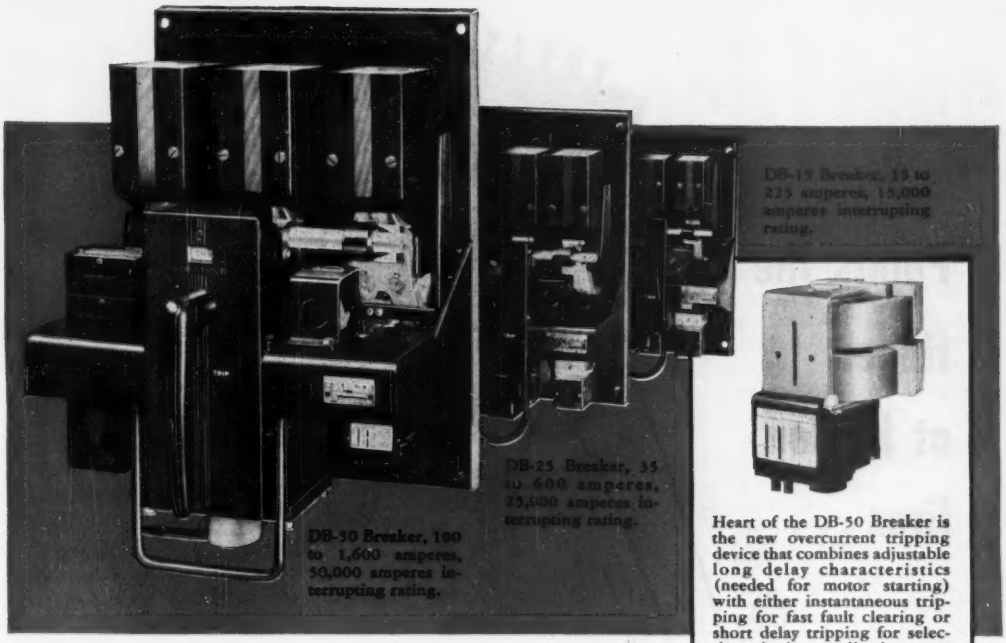
REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND


DB-50 Breaker, 100 to 1,600 amperes, 50,000 amperes interrupting rating.
DB-25 Breaker, 35 to 600 amperes, 25,000 amperes interrupting rating.
DB-15 Breaker, 15 to 225 amperes, 15,000 amperes interrupting rating.

Heart of the DB-50 Breaker is the new overcurrent tripping device that combines adjustable long delay characteristics (needed for motor starting) with either instantaneous tripping for fast fault clearing or short delay tripping for selective tripping applications.

Now...15,000, 25,000, 50,000 amp.* Breakers *in a UNIFORM DESIGN!*

The new DB-50—most recent addition to the DB line of low-voltage breakers—extends the range of interrupting ratings to 50,000 amperes, continuous current ratings to 1,600 amperes. The co-ordinated design provides uniformity in construction features and operating characteristics, plus a completely flexible overcurrent tripping device.

The ability to close and latch on fault current is the latest and most severe requirement of a modern breaker. This requirement results from delayed tripping schemes designed to provide selective operation. Closely allied is the additional requirement of ability to carry, for periods up to 30 cycles, fault currents equal to the interrupting rating. Contacts, latching mechanism, and closing means of the uniformly-designed Westinghouse DB line of low-voltage air circuit breakers meet these rigid requirements.

The DB-50 has the same desirable unit construction as its smaller counterparts. It is this feature that allows you to add or remove any component as an assembled unit in the field.

Booklets B-4067 on the DB-15 and DB-25, and B-4740 on the DB-50 contain complete information. For copies, call your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

See "Electrical Proving Ground" . . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse representative or write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania. J-60748

YOU CAN BE SURE... IF IT'S Westinghouse

"DE-ION" CIRCUIT BREAKERS

TYPE DB

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH-POWER LABORATORY

*Interrupting Rating

Points the finger at hidden fires . . .

Slow-burning fires may smolder for hours before they generate enough heat to set off fire detecting devices. But they can be spotted within a few seconds by a *Kidde* smoke detecting system.

A single *Kidde* Multi-line Smoke Detector System can protect one room or many rooms in the same building. A central electronic control board tells the exact location of the fire—and transmits a warning to your fire control headquarters or the local fire department.

You can combine this efficient *Kidde* Smoke Detector System with a *Kidde* CO_2 Fire Extinguishing System. See your nearest Kidde representative or write for full information.

Kidde

Walter Kidde & Company, Inc., 730 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada, Limited, Montreal, P. Q.

6 New Trolley Coach Lines for Boston

Metropolitan Boston likes trolley coaches. And because it does, the Metropolitan Transit Authority's fleet has grown steadily since the first installation in 1936. This year, for example, six new trolley coach routes will be established.

Popular acclaim by riders has played an important part in each MTA decision to extend trolley coach service. This popularity, as well as management's appreciation of the trolley coach's reliability and relatively low operating cost, accounts for the growth of MTA's trolley coach fleet.

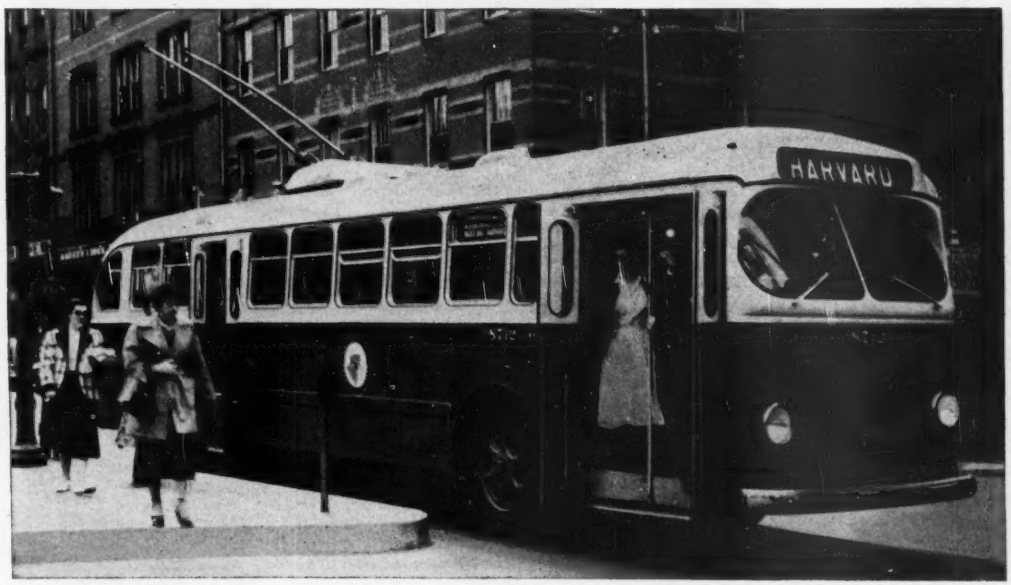
In medium-sized as well as large cities, forward-looking transit operators are using this modern electric vehicle more and more. Presently, trolley coaches are operating in 67 cities throughout the country, with populations ranging from 80,000 to upwards of 2,000,000 people. General Electric Company, Schenectady, New York.

OPERATING COSTS PER REVENUE MILE

(exclusive of depreciation)

YEAR	TRACKLESS TROLLEY	BUS
1945	39.02¢	46.83¢
1946	43.03	51.00
1947	45.21	55.30
1948	54.77	61.53
1949	54.90	64.87

Average seating capacity of MTA trolley coaches is 42; self-propelled vehicles have an average seating capacity of 38.



GENERAL ELECTRIC

1,300,000 accounting stubs need ALL THIS SPACE

but THIS ONE BOX* holds 1,500,000 microfilm copies

...and that's not all that microfilm saves

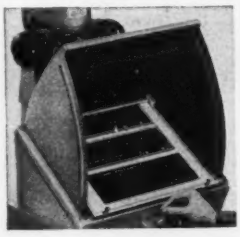
To one large public utility, keeping customers' bill stubs on file for the period required by law *used* to mean finding storage space for ten and a half million stubs. Before this firm adopted microfilming, *that* meant renting space five miles away—plus the cost of transporting the records.

But today — what a difference! This Company now keeps microfilmed copies of all their stubs at the home office. They are saving the cost of the former storage space . . . of the transportation . . . of the hours of waiting time when they need to consult a record.

They also have added *security*. By using a dual-lens camera, they make two photographs of each stub — the "extras" to be stored at a distant point for safe-keeping, with the same phenomenal savings in space.

Microfilm saves up to 99% in space. 15,000 stubs fit on a roll only 1" wide, 5⅜" in diameter. Cost is nominal. Get full information at once on the savings microfilm can make for you. Write today for booklet F 212. Address Management Controls Reference Library, Room 1233, 315 Fourth Ave., New York 10.

**10¾" x 10¾" x 25"*



To examine a customer's account, it is a simple matter to place the film in a Film-a-record Reader and refer to the wanted stub in a few seconds. The card appears clearly, enlarged to actual size.

Remington Rand INC.

Another NORDBERG FIRST

the Supair Thermal Engine

THE MOST OUTSTANDING DEVELOPMENT IN MODERN DIESEL DESIGN

The *SUPAIRTHERMAL* Engine, the outstanding engine of the Diesel field, is available in a complete range of 4-cycle types for fuel oil, Diesel, or spark ignition gas operation . . . for all applications, in sizes from 425 to 3200 B.H.P.

Write for further information on the *SUPAIRTHERMAL* Engine . . . the most outstanding development in a long line of famous Nordberg "FIRSTS".

NORDBERG MFG. CO.
Milwaukee 7, Wis.

featuring:

- ONE-THIRD MORE HORSEPOWER THAN CONVENTIONAL TURBO-CHARGED ENGINES
- MORE HORSEPOWER IN LESS SPACE
- MORE HORSEPOWER PER GALLON OF FUEL
- MORE HORSEPOWER HOURS PER GALLON OF LUBE OIL
- INCREASED THERMAL EFFICIENCY
- LESS HEAT LOSS TO WATER JACKETS
- LESS WEIGHT PER HORSEPOWER
- LOWER INSTALLATION COST
- LOWER OPERATING COST
- LOWER MAINTENANCE COST

MUSCH-SULZER
A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

Modernized Meter Test Procedures demand *the standard of accuracy*

The growing interest in shop testing of service meters indicates that *now* is the time to re-examine your test equipment and procedures. Maximum efficiency and maximum accuracy are assured only when modern laborsaving equipment is combined with the most accurate standard. The accuracy of your service meter testing can be no better than the accuracy of your rotating standard.

Sangamo Type J Rotating Standards can be your standard of accuracy because they are:

- ACCURATE—as the result of fundamental design.
- ACCURATE—as the result of painstaking, expert calibration.
- ACCURATE—since calibration is practically unaffected by age or usage.

Build *your* modernization program around this standard of accuracy—the Sangamo Type J Rotating Standard. Specific technical information is given in Bulletin 290. Write for your copy today.

SANGAMO — *Only Measured Facts are Known Facts*

Sangamo Type J
Rotating Standards
(The Standard of Accuracy)

Straight line load curve on all current ranges.

Thermal current carrying capacity to 200% load.

Minimum deviation between current ranges.

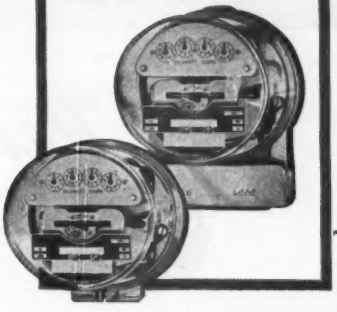
Fully compensated for temperature and voltage variations.

Available in 1, 3, 4 or 5 current ranges.

The above close-up shows the unique arrangement used by the Southern California Edison Company. The Sangamo Type J Rotating Standard is mounted horizontally behind a panel with a combination of mirrors to provide for maximum ease of reading. The large photograph shows their very modern Meter Testing Department.

Sangamo J Meters

These watthour meters meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

"When I paint the POLE STAR it stays painted"

says John Fedorkovic
Pole Star Painter

Whatever can be said about transformer paints, this is certain — the life of any good paint depends upon two things:

1. the condition of the surface to which the paint is applied;
2. the thickness of the paint coating.

By using a superior paint and by giving special attention to these two important considerations, Pennsylvania gives each Pole Star tank the maximum amount of protection for the longest possible time.

GRIT-BLASTING

Although generally more expensive than other methods of surface preparation, blasting with steel grit insures that the tank surface will be absolutely clean and free of grease and dirt; and that the surface will be roughened to provide "toothage" to increase the adhesion of the first coat to the steel surface.

FLOW-PAINTING

A flowed film of paint is heavier and more uniform over a large surface than a spray film and has the added advantage of reaching inaccessible places. The primer coat is first flow-coated on the tank. After it is thoroughly baked dry, a coat of blue-gray transformer paint is flowed on, and it too is oven-dried.

SPRAYING

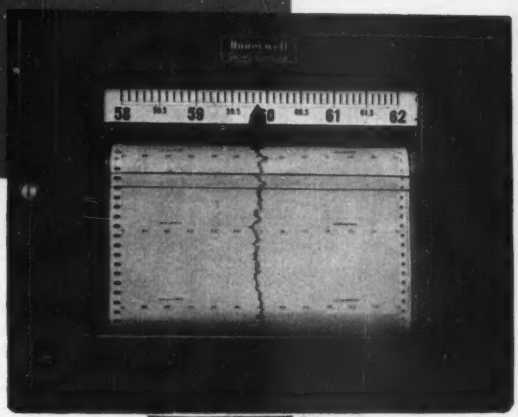
A spray-applied film of paint has a better appearance than a flow-applied film. Thus, the third coat of paint, a blue-gray finish coat, is sprayed on to add to the film thickness and to insure a smooth finish with a maximum amount of gloss.

Pole Star Transformers are available in sizes 3 Kva through 100 Kva, 2400 through 14,400 Volts. Protected Pole Star Transformers available in the same ratings, are equipped with safety devices for maximum electrical protection.

Pennsylvania

TRANSFORMER COMPANY
CANONSBURG, PENNSYLVANIA
Greater Pittsburgh District

for continuous and uninterrupted frequency measurement



Check these

IMPORTANT FEATURES

- √ *Continuous Balance measuring system—with electronic non-cyclic balancing*—not *mechanical in operation.*
- √ *Frequency change as small as 0.01 cps initiates rebalancing action.*
- √ *Calibrated accuracy within ± 0.025 cps at normal frequency.*
- √ *Unit construction eliminates delicate mechanical linkages . . . assures long trouble-free operation with minimum of maintenance.*

For further details, write for Data Sheet No. 9.1-8.

THE *ElectroniK* FREQUENCY RECORDER

THE *ElectroniK* Frequency Recorder is a *must* for every central station and systems office. It provides an *uninterrupted* check on generator performance by its instantaneous measurement of frequency . . . furnishes an accurate, permanent record . . . and makes load dispatching easier.

Operating on the electronic "continuous balance" principle, the recorder features unusual sensitivity and dependability. Its balancing motor and mechanism move only during a frequency change, thus reducing wear of parts to an absolute minimum. Its scale—12 inches wide—makes for easy readability at a distance, for checking the direction and amount of frequency deviation.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Avenue, Philadelphia 44, Pa.

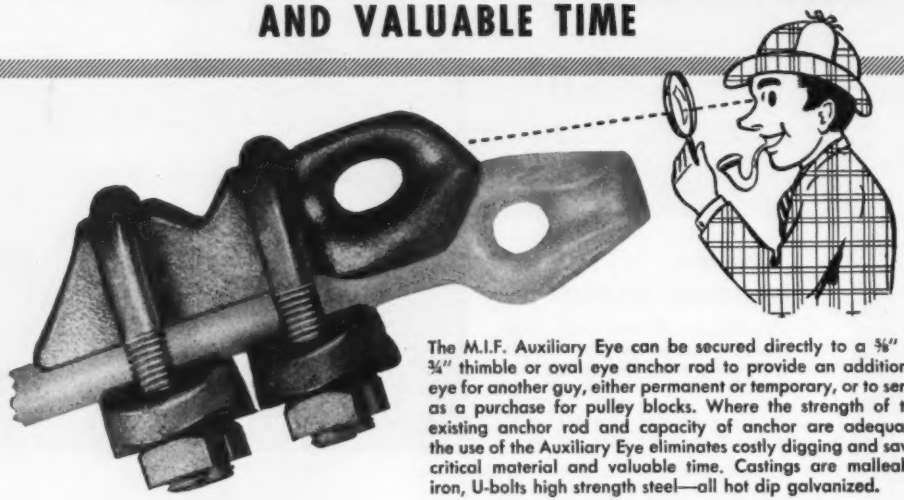
MINNEAPOLIS **Honeywell**

Brown Instruments

THIS "PRIVATE EYE" HAS DISCOVERED

MIF AUXILIARY EYE

SIGNIFICANT SAVINGS OF CRITICAL MATERIALS AND VALUABLE TIME



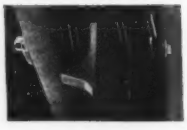
The M.I.F. Auxiliary Eye can be secured directly to a ⅜" or ¾" thimble or oval eye anchor rod to provide an additional eye for another guy, either permanent or temporary, or to serve as a purchase for pulley blocks. Where the strength of the existing anchor rod and capacity of anchor are adequate, the use of the Auxiliary Eye eliminates costly digging and saves critical material and valuable time. Castings are malleable iron, U-bolts high strength steel—all hot dip galvanized.

Other M.I.F. Specialties That Save Critical Materials Or Valuable Time!

By using Williams Pole Mounts where pole butts have rotted, the service life of wooden poles can often be doubled. Salvaging the sound portion of the pole eliminates costly change-over time. For new construction through wet or rocky terrain, the use of Williams Pole Mounts assures maximum pole life. They also add 6 to 10 feet to the effective height of a pole on a new installation.

The Jenne Safety Guy Strand Holder offers the safest and most economical method of handling guy strand. Once in the holder the coil cannot go "wild," thus eliminating a hazard to both lineman and passing traffic. The strand pays out from the center and will uncoil only when pulled. No attention is required at the holder. Weighing only 11 lbs. and available in several sizes, the Jenne Holder can readily be carried to the job. It can also be mounted on a bracket on a line truck.

M.I.F. Crossarm Gains, combined with M.I.F. Washers of suitable size and strength, afford an efficient, economical method of securing round arms on H-frame structures. M.I.F. Gains serve both as supports and transition pieces. Arms can be ordered pre-drilled and creosoted thereby eliminating costly on-the-job spotting and drilling of holes since the through bolts always pass through the diametric center of the arm. M.I.F. Crossarm Gains provide effective support even when arms are out-of-round.



By using M.I.F. Transformer Plates, transformers with suspension hook mountings may be converted readily for through bolt attachment. They eliminate expensive crossarm or doublearming, allow the use of serviceable old transformers interchangeably and give greater security against dislodgement—also permit interchangeability with new transformers fitted with standardized support lugs. Plates are used in sets of twos.

MALLEABLE IRON FITTINGS CO.

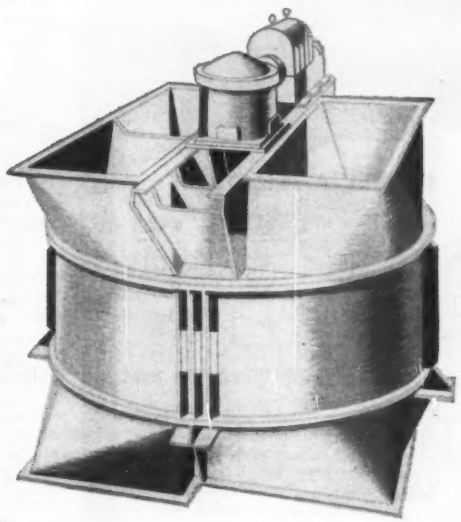
Pole Hardware Div., Branford, Conn.
N. Y. Office: 30 Church St.
Canadian Mfr. & Dist., LINE & CABLE ACCESSORIES, Ltd., TORONTO

Representatives: WM. J. COTTRELL CO., Portland, Ore. • JAMES H. DREW CORP., Indianapolis, Ind. • INDUSTRIAL ENGINEERING & EQUIPMENT CORP., Los Angeles, Cal. • JSG ELECTRIC CO., Chicago, Ill. • E. A. THORNWELL, INC., Atlanta, Ga. • J. P. VOIGHT, Summerville, S. C. • WALTHAM, DE WITT & KRUSI, San Francisco, Cal. • L. R. WARD CO., Dallas, Tex. • WILLIAMS SALES AGENCY, Fort Myers, Fla. • O. C. WITTE CO., Detroit, Mich. • WILLIAMSON SALES CO., Shreveport, La.

The Ljungstrom Air Preheater Can Help You

1. To improve combustion of low-grade fuels
2. To raise the level of heat recovery
3. To save materials in plant design

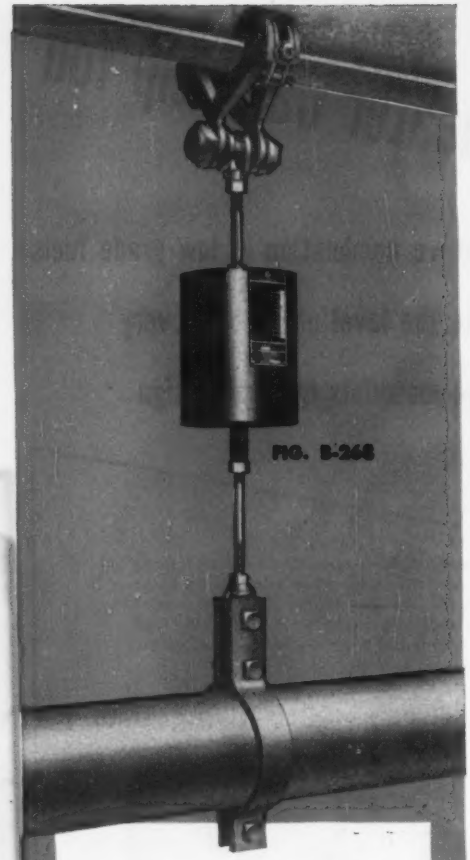
The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.



If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.



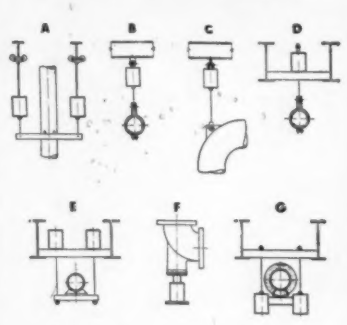
Pre-solve Pipe Suspension Problems...

with
Grinnell Pre-engineered Spring Hangers

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range where variation in supporting force is at a minimum.
- Compact—minimum headroom made possible by precompression*.
- Guides prevent contact of coils with casing wall or hanger rod and assure continuous alignment and concentric loading of spring.
- All-steel welded construction meets pressure piping code.
- 16 sizes available from stock — load range from 74 lbs. to 9000 lbs.
- Easy selection of proper sizes from simple capacity table.
- Installation is simplified by integral load scale and travel indicators.
- Unique swivel coupling provides adjustment and eliminates turnbuckle.

*Precompression is a patented feature.

TYPICAL APPLICATIONS

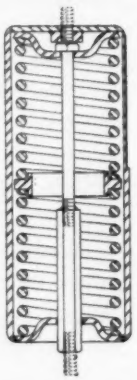


(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

FOR LESS VARIATION IN SUPPORTING FORCE — FIG. 98

Fig. 98 is an adaptation of Grinnell's popular spring hanger, Fig. 268. It consists of two springs arranged in series within a single casing. A centering guide insures the permanent alignment of the spring assembly.

Fig. 98 has half the load deflection rate, and double the total working range of Fig. 268. Its 16 spring sizes accommodate loads from 74 lbs. to 9000 lbs. — but with a total working range *up to 5 inches!* Fig. 98 comes in the same seven types as shown for Fig. 268. Design details for identical types and sizes are the same for Fig. 98 and Fig. 268.



GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

No substitute here for EXPERIENCE

— in men and materials!

Specialized knowledge is an important part of any job. Make certain of tape quality by specifying Accurate — the tape with over 30 years experience behind its manufacture!

ACCURATE

Plastic Tape

Offers a bulk-reducing combination of thin caliper, good mechanical and dielectric strength. Recommended for use wherever plastic tape is practical.

ACCURATE TAPES

. . . for every INSULATING need!

ACCURATE RUBBER TAPE

Features high elasticity, excellent cohesion, high dielectric and super aging qualities. Available in Standard and A.S.T.M.-A.A.R. grades.

ACCURATE FRICTION TAPE

High grade rubber carefully compounded with finest cotton base provides maximum mechanical protection for every wrap. Made in Standard and A.S.T.M. grades.

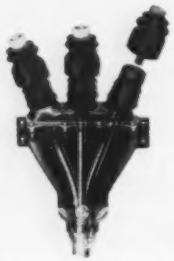
. . . no finer tapes at any price!

For big wiring jobs or small, Accurate is the choice for positive tape protection. Both friction and rubber are strong, pliable, easy to apply. Accurate tapes make accurate wraps — pull tight and clean over irregular surfaces. When you order tape, mention Accurate by name. It's the one sure way to complete tape satisfaction. For a complete guide to tape selection and tape buying, ask for the new Accurate Data Folder. Accurate Mfg. Company, Garfield, New Jersey — address inquiries to Dept. D.

amc

ISOLATE EQUIPMENT and PRIMARY FEEDERS with G&W DISCONNECTING POTHEADS

Disconnecting potheads provide convenient means for sectionalizing and isolating distribution circuits and equipment. These hermetically sealed cable terminations with porcelain enclosed plug and socket disconnects are used singly or with gang operating mechanisms to perform many sectionalizing tasks.

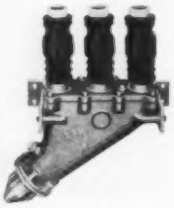


Plug and socket disconnect for convenient non-load-break isolation of equipment.

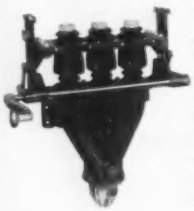
Where a second feeder is available at pole top or in vault or manhole, disconnecting potheads are used to transfer load to the second feeder and isolate the normal feeder for test, maintenance, or repair. Dummy caps protect the feeder not in use.

To isolate equipment or feeders, dummy centers are inserted between the plug and socket portions of the disconnect.

Flexible jumpers on disconnecting pothead caps permit connections to be shifted as required. This type of installation is often used for shifting load connections to balance three phase lines feeding single phase loads.

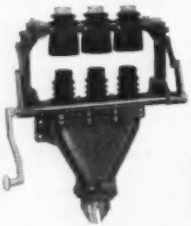


45° angle body specially designed for pole-top mounting.



Compact gang operating mechanism in closed position.

Gang operating mechanisms, especially suitable for vault and cubicle installation, provide visible air break at the cable termination. They save space and eliminate the necessity of other isolating devices.



Visible air break isolation in open position.

Single and multiple conductor disconnecting potheads rated 5,000, 7,500, and 15,000 volts non-load-break are listed in G & W Bulletin AB51. Write for your copy today.

Use G & W Cable Accessories for
TERMINATING
FUSING—SWITCHING
SPLICING—CONNECTING

OIL FUSE CUTOUTS

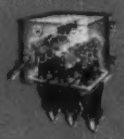
Single or Gang Operated Fuse-Switch Units

Write for Bulletin CA50

LOAD BREAK OIL SWITCHES

600, 7,500, 15,000 and 23,000 Volts.

400 Ampere Load Break



Rocker Arm Links in Many Switching Arrangements.

CABLE BOXES

Air or Oil Filled

Fuses, Links or Direct Connection

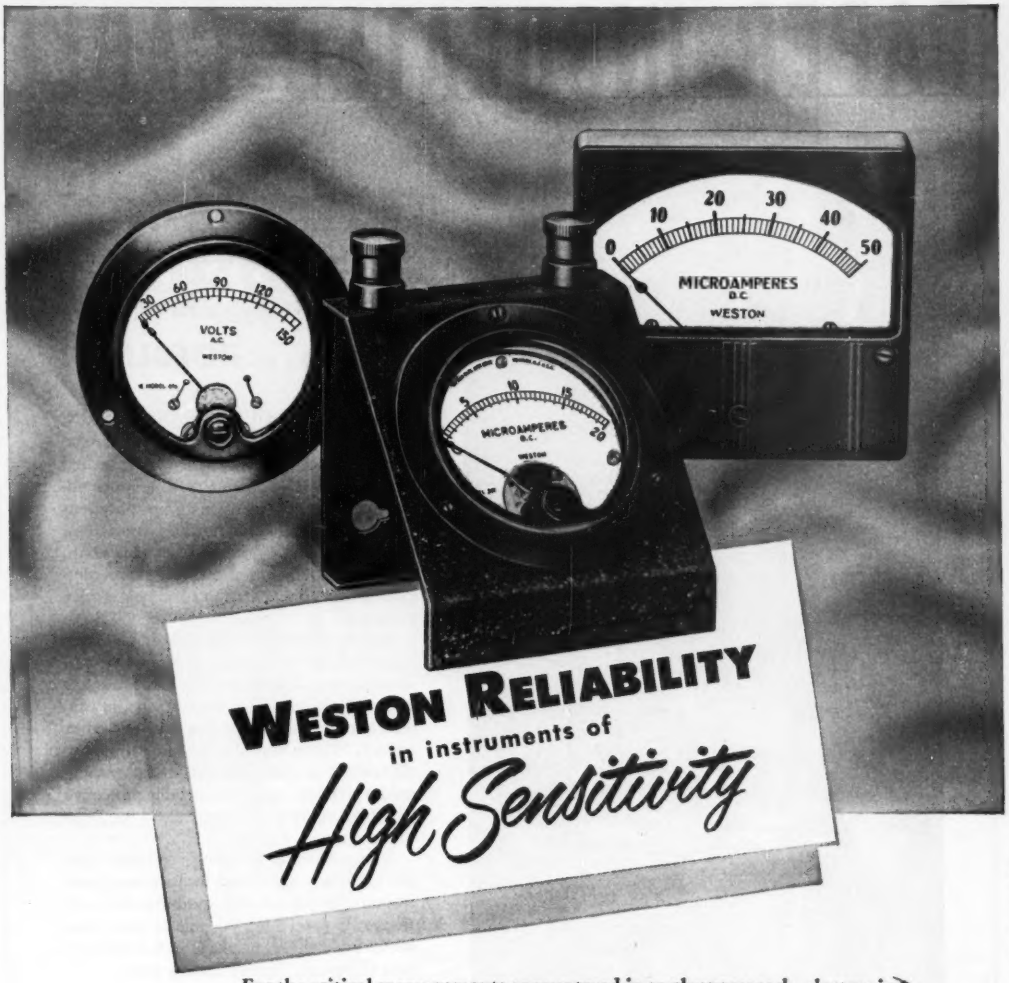
Many Sizes, Styles, Ratings

UNIT SPLICING KITS

Packaged Materials for Properly Designed Joints for all Types of Cables

Write for Bulletin J50

G&W ELECTRIC SPECIALTY COMPANY
7780 DANTE AVENUE • CHICAGO 19, ILLINOIS, U.S.A.
Representatives in principal cities. In Canada, Powerlite Devices, Ltd., Toronto



WESTON RELIABILITY

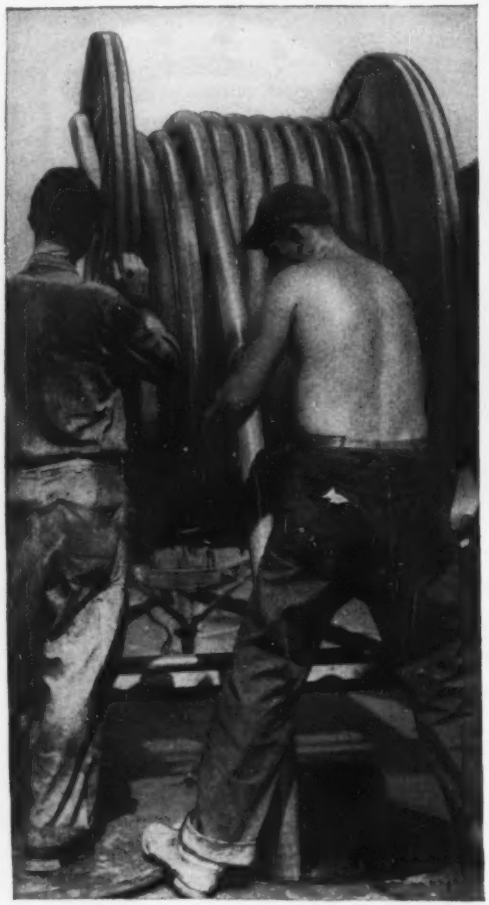
in instruments of

High Sensitivity

For the critical measurements encountered in nuclear research, electronics or in general test procedure, WESTON supplies a broad line of instruments in types and sizes for all requirements. All embody true WESTON precision and dependability; and all D-C, rectifier type A-C and RF instruments have inbuilt magnetic shunts which permit minor field adjustments if necessary. Complete information is available from the WESTON representative near you, or direct; and full cooperation on special instrument requirements is freely offered. Weston Electrical Instrument Corporation, 594 Frelinghuysen Ave., Newark 5, N. J., manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

PAPER INSULATED CABLE



For unsurpassed performance . . . low-cost service . . . ROEBLING!

FOR UNDERGROUND TRANSMISSION, distribution and service circuits, there are no finer cables than Roebling Paper Insulated Lead Encased. Manufactured to your individual specifications, or to specifications adopted as standard by leading associations of power cable engineers, Roebling materials, methods and precision control assure completely dependable products and long service economy.

Roebling Shielded Type H is an outstanding selection for 3-phase grounded neutral circuits from 13 to 33 kv. It is made in single and multiple conductor construction, in concentric round or Compack strand (round or sector). Where the cable will be exposed to electrolysis or corrosion, the lead sheathing can be given an outer non-metallic protective jacket of ROESHEATH (NEOPRENE) or Polyethylene.

A large share of Roebling's complete wire and cable line is required in the rearmament program, but the Roebling organization will always do everything possible to meet your service and delivery needs. John A. Roebling's Sons Company, Trenton 2, New Jersey.

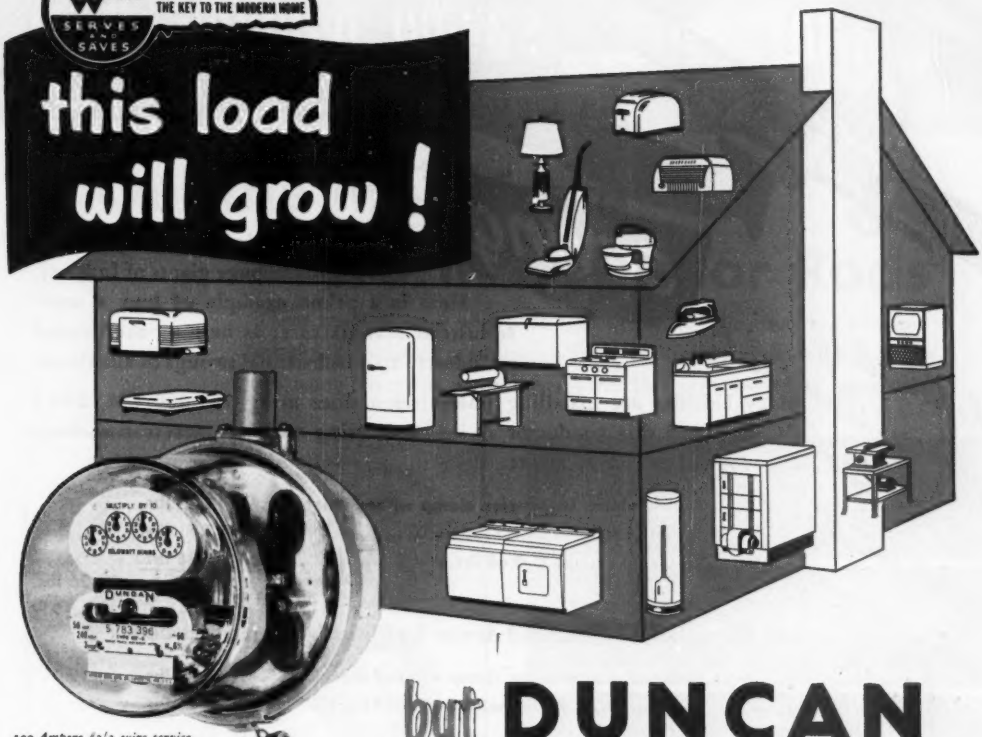
ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

ADEQUATE WIRING SERVES AND SAVES

THE KEY TO THE MODERN HOME

this load will grow !



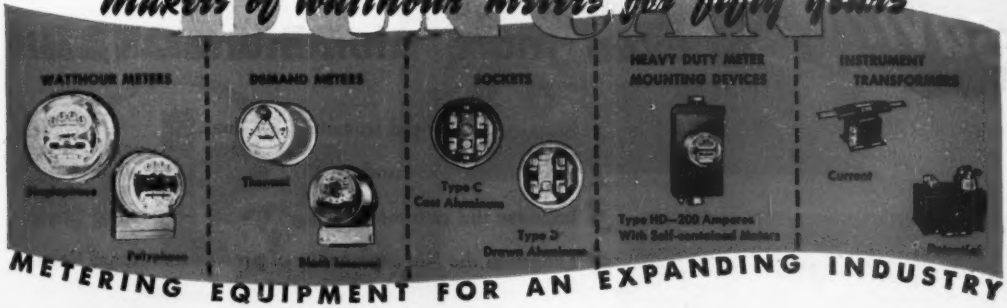
200 Ampere 4-2/3 wire service cable installation using a DUNCAN Type D socket and a 15 or 50 ampere meter as the anticipated load growth indicates.

but DUNCAN meters provide for it !

Although the growth of electrical living will increase load requirements far beyond present levels, DUNCAN has designed its metering equipment to handle those heavier loads. Your metering dollar of today enables you to buy equipment with the necessary capacity to meet this load growth. Duncan Electric Mfg. Co. Lafayette, Ind.

DUNCAN

makers of watthour meters for fifty years



METERING EQUIPMENT FOR AN EXPANDING INDUSTRY

saving aluminum here

saving of critical materials is not solely the prerogative of the huge giants of Industry. Here is a prime example of how a small Industrial Manufacturer is helping the Central Station Industry make substantial savings of aluminum.

Many Utilities are installing transmission lines using 795,000-CM, 26x7 ACSR. When this conductor is installed, using ordinary accessories, there are required at each support:

1—Aluminum suspension clamp without shackle . .	8.20 lbs.
1—Set of tapered armor rods	13.7 lbs.
2—Ovoid clamps @ 0.68 lbs.	1.36 lbs.
	23.26 lbs.

But the equivalent Preformed Armor Rod installation requires only:

1—Smaller suspension clamp without shackle. . . .	6.23 lbs.
1—Set of 0.310" Preformed Aluminum Rods 100" long .	10.08 lbs.
No Ovoid clamps	.....
	16.31 lbs.

saving— 6.95 lbs.

Each pound of Preformed Armor Rods used makes possible a potential saving of 0.7 pounds of critical aluminum. Write on your letterhead for complete details.

This results in a saving of 30% of critical aluminum. Similar savings develop for all sizes of conductor. And to further reduce the total consumption of aluminum, some Utilities use Steel Preformed Armor Rods on #4 and #2 ACSR.

saving of even more aluminum is made possible by using Preformed Armor Rods to:

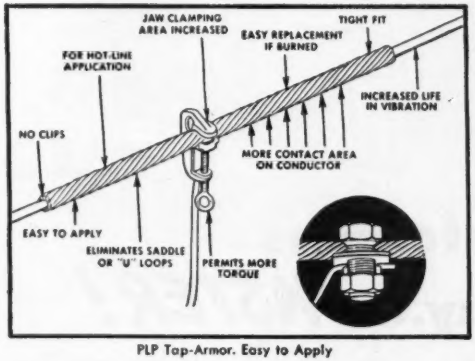
1. Repair and rebuild transmission lines.
2. Rehabilitate old conductors.
3. Increase the current-carrying capacity of existing lines.
4. Lengthen the life expectancy of present and future lines.

armor rods today assure more operating conductor tomorrow

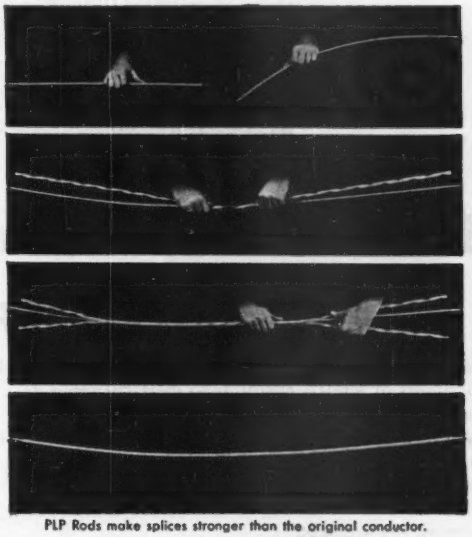
means more miles of conductor . . .

Get the most from Preformed Armor Rods

These revolutionary new rods are not just for the armoring of transmission conductors at support points. Utilities throughout the Country are using them for many other jobs. Here are just a few examples:

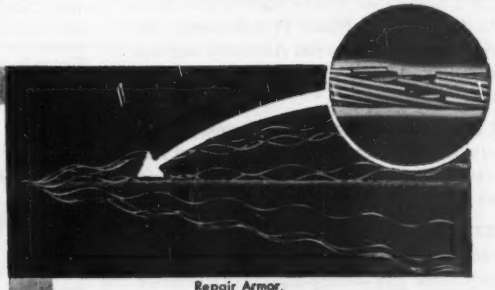


PLP Top-Armor. Easy to Apply



PLP Rods make splices stronger than the original conductor.

also . . Preformed Jumpers, Strand Armor, Dead-Ends for Guys and Conductors, Tie Wire, Dual-Conductor Spacers, Lashing Armor, Dampers and Suspension Clamp Jumpers.



Repair Armor.

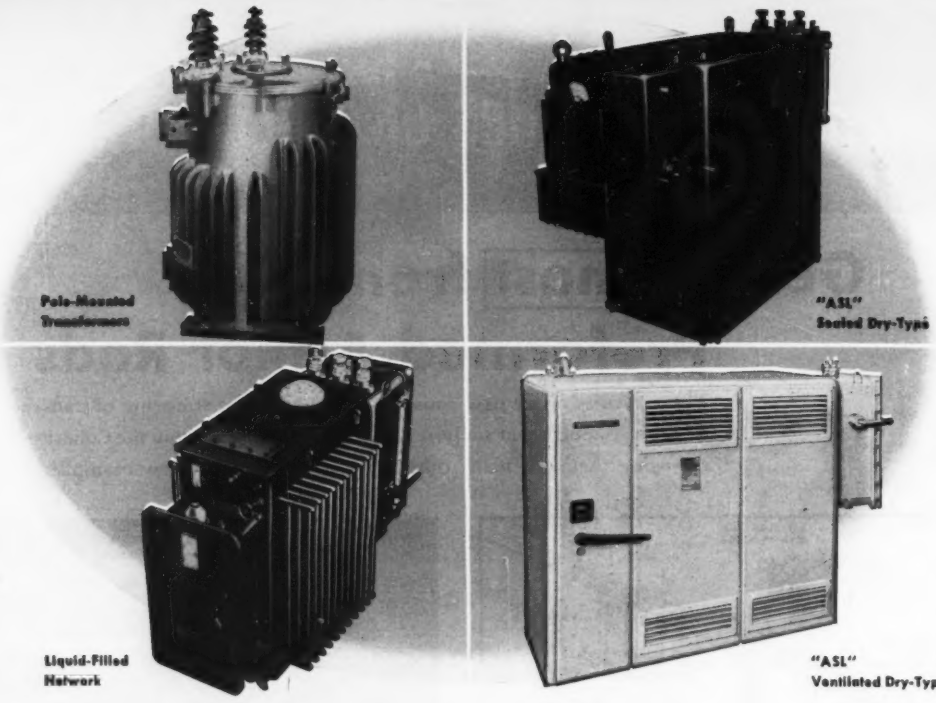
PREFORMED

PLP

LINE PRODUCTS CO.

CLEVELAND 3, OHIO

PREFORMED ALUMINUM ALLOY RODS ARE APPROVED BY ALL COMPANIES MANUFACTURING ACSR.



Standardized Transformers make networks pay... *FASTER!*

Sure, network systems pay. The big savings come from continuity of service, flexibility to meet changing demand. But there's another important saving available right now. That's the saving you can realize in transformer costs. Standardization brings production economies that are passed directly to you.

These four standard transformers meet every network requirement:

FOR GENERAL USE. Liquid-Filled Transformers, the workhorse of the network system. Available in sizes 1000 kva and below, 34,500 volts and below, oil or Inerteen® filled.

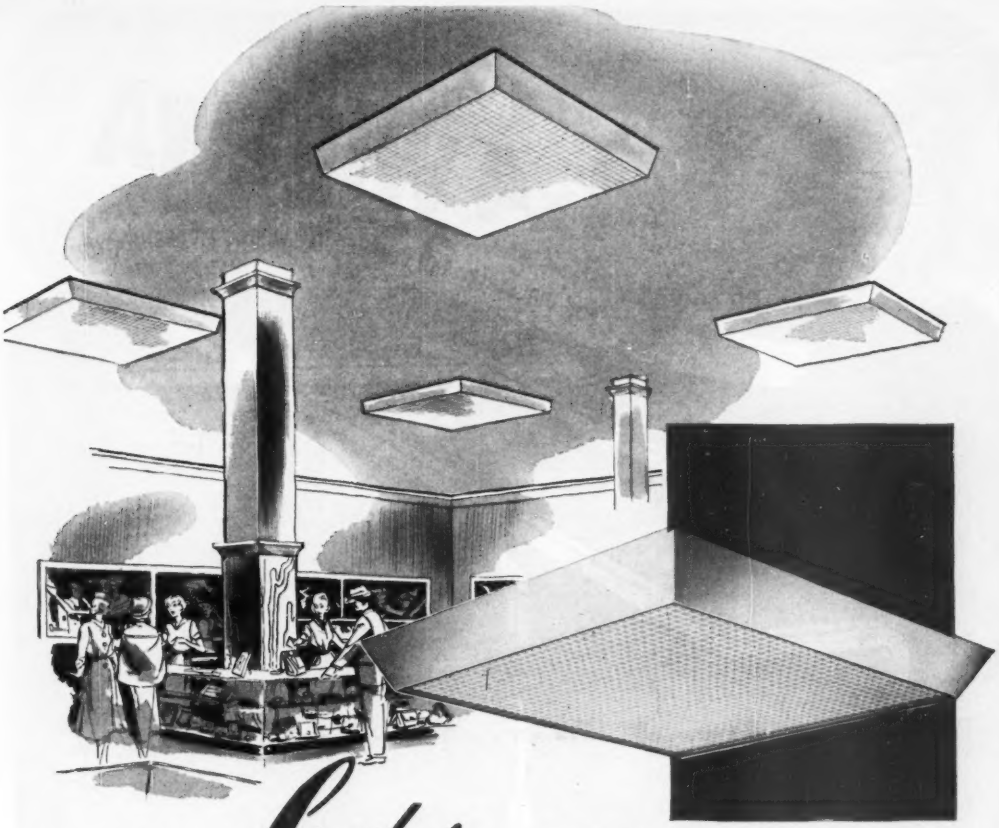
FOR INDOOR SERVICE. Dry-Type Transformers, ideal for indoor networks . . . lightweight, economical and maintenance-free. Available in sizes 1000 kva and below, 15,000 volts and below.

FOR GREATEST SAFETY. Sealed Dry-Type Transformers give greater safety for crowded areas, or where hazards like explosive gas atmospheres, corrosion or water conditions are not suitable for ventilated dry-type. 1000 kva and below, 15,000 volts and below.

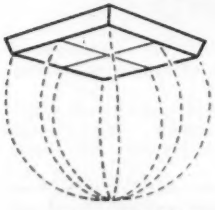
TOPS FOR ECONOMY. Pole-Mounted Transformers for overhead networks. Available in a wide range of sizes, from 150 kva and smaller 15,000 volts and below.

Let us talk them over with you and point out the specific economies that can fit into your plans best. In addition, our complete facilities . . . engineers and calculating boards . . . are available to help you make future expansion more economical. Ask your Westinghouse representative, or write for booklets B-4028 and B-4002A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.
J-70587

YOU CAN BE SURE.. IF IT'S
Westinghouse
NETWORK TRANSFORMERS



The new Leader Square Series



BETTER LIGHT . . .
BETTER MERCHANDISING

Effective highlighting is one of modern merchandising's greatest aids. Leader's new Square fixtures flood selling areas with abundant, non-glare light. Also, because these fixtures are so powerful, no additional units are needed for overall illumination. Steel channel, housing and side panels . . . 40° x 40° featherweight plastic louver. 2′ x 2′, 3′ x 3′, 6′ x 6′ and 8′ x 8′ sizes available as well as 4′ x 4′ size shown.

A truly amazing light source . . .
Economical to install . . . Pleasing in design

These striking new units, for recessed, semi-recessed, surface or suspension mounting, furnish intensive light for selected areas, at the same time providing abundant overall illumination. The most popular size is four feet square, with choice of 4, 6, 8 or 10 lamps, either conventional 40-watt or T-12 single pin Slimline. Larger size of fixture means fewer units to buy, to install, to service. Voluminous light output eliminates necessity for special fixtures for intensive lighting. Leader's Square units are ideal for department stores, offices, cafeterias, drafting rooms . . . or wherever the demand is for efficient, low cost, truly modern lighting.

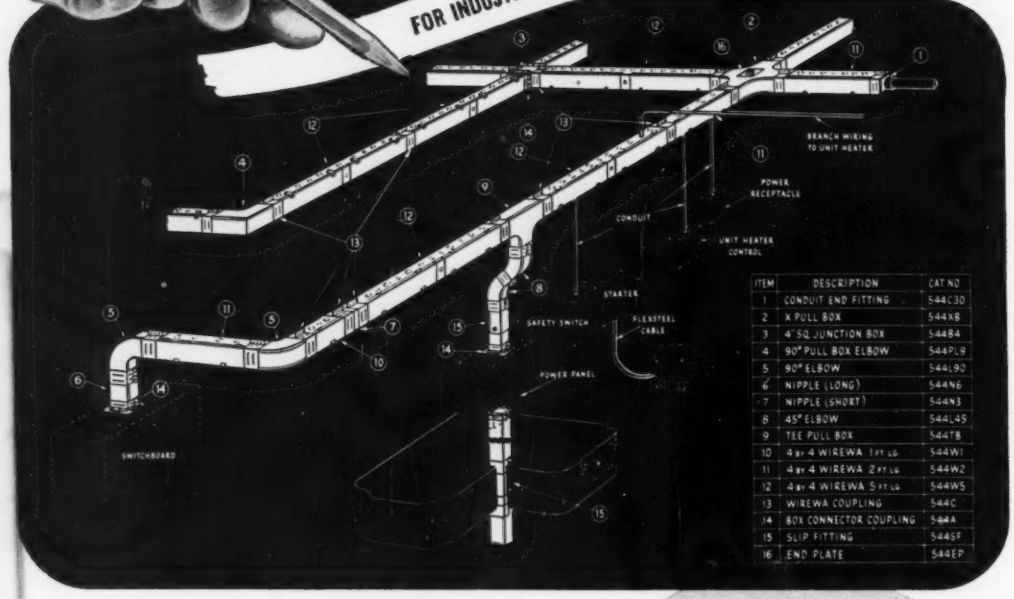
Sold and installed by the better electrical dealers and contractors

Leader *America's No. 1 Lighting Equipment Manufacturer*

LEADER ELECTRIC COMPANY • 3500 N. KEDZIE AVENUE, CHICAGO 18, ILL.
Leader Electric—Western: 800 One Hundredth Avenue, Oakland 3, California
Campbell-Leader, Ltd.: Brantford, Ontario • Canada

Specify National Electric 4x4 WIREWĀ

FOR INDUSTRIAL AND COMMERCIAL WIRING MODERNIZATION



ITEM	DESCRIPTION	CAT. NO.
1	CONDUIT END FITTING	544C30
2	X PULL BOX	544XB
3	4" SQ. JUNCTION BOX	544B4
4	90° PULL BOX ELBOW	544PL9
5	90° ELBOW	544L90
6	NIPPLE (LONG)	544N6
7	NIPPLE (SHORT)	544N3
8	45° ELBOW	544L45
9	TEE PULL BOX	544TB
10	4 by 4 WIREWA 1 FT. LG.	544W1
11	4 by 4 WIREWA 2 FT. LG.	544W2
12	4 by 4 WIREWA 5 FT. LG.	544W5
13	WIREWA COUPLING	544C
14	BOX CONNECTOR COUPLING	544A
15	SLIP FITTING	544SF
16	END PLATE	544EP

Sketch of a typical 4 x 4 WIREWĀ installation showing complete flexibility, simplicity and use of fittings.

Plant men like National Electric 4 x 4 WIREWĀ for protecting wiring—wiring that may be rerouted, changed, tapped, or spliced frequently. National Electric WIREWĀ provides steel protection, plus accessibility, unequalled by any other type of wiring raceway, for housing of electrical wiring systems up to 600 volts.

STEEL FOR PERMANENCE . . .
GROUNDED FOR SAFETY!

Listed by Underwriters' Laboratories, Inc.

HERE'S WHY

4x4 Wirewā will do the job.

- **It goes up fast . . . can be tapped or rerouted without disturbing existing installations.**
- **No flanges to line up and bolt when assembling sections. Wrap-around hinged couplings—only two bolts to tighten.**
- **It may be mounted direct to wall or suspended from ceiling. Couplings may also serve as hangers.**
- **Low maintenance, simple to reroute and extend —100% salvable.**

EVERYTHING IN WIRING POINTS TO

National Electric
PRODUCTS CORPORATION
1305 CHAMBER OF COMMERCE BUILDING, PITTSBURGH 19, PA.

U·S·S Creosote Oil

MEETS EVERY SPECIFICATION

U·S·S CREOSOTE OIL is prepared to comply with the specifications of the American Wood Preservers' Association and the American Railway Engineering Association. There's no batch-to-batch variation in quality, for U·S·S Creosote Oil is the product of continuous processing in the world's largest tar distillation plant.

And, no matter how exacting *your* requirements may be, one car will convince you that U·S·S Creosote Oil fills the bill. Its deep, effective penetration and high toxicity add years of life to treated wood . . . sharply reduce your future replacement costs.

Five sales offices from coast to coast assure you prompt service when you specify U·S·S Creosote Oil. If you'd like additional information on this time-tested preservative, get in touch with the nearest of these offices today.

UNITED STATES STEEL COMPANY
525 WILLIAM PENN PLACE · PITTSBURGH 30, PA.
71 Broadway, New York 6, N. Y.
208 South La Salle St., Chicago 90, Ill. 1509 Terminal Tower, Cleveland 13, Ohio
Brown-Marx Building, Birmingham 2, Ala. 25 Beale St., San Francisco 5, Calif.
United States Steel Export Company, New York

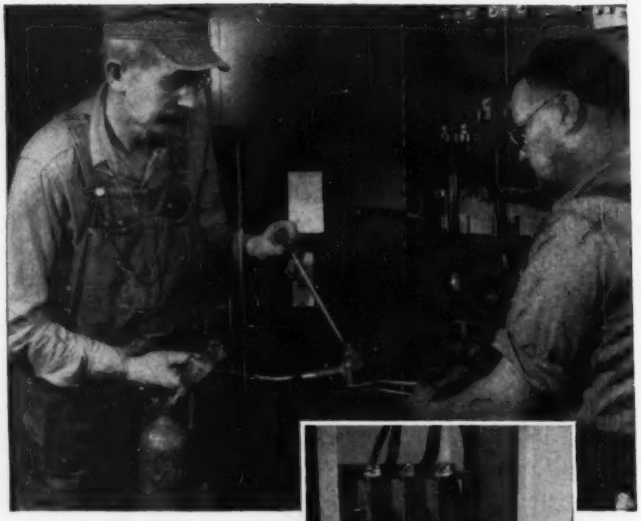
USS

CREOSOTE OIL

UNITED STATES STEEL

40% Saved on new wiring

At Stewart-Warner Electric's radio and television plant in Chicago, 4/0 Aluminum RH insulated conductor supplies 440-volt AC power for a new assembly line. Savings due to using Aluminum amounted to over 40% because of the cable's low initial cost and the easier, faster installation of the lighter-in-weight metal.



Electricians Howard Norton (left) and Al Iverson soldering aluminum connections at distribution panel. *Below:* Howard Norton, looking over completed job at panel said, "Aluminum is very satisfactory to install because of its lightness and workability . . ."

figure your new wiring job in Aluminum and figure low

Get prices both ways—in Alcoa Aluminum and in copper. See for yourself the worth-while savings possible when you plan wiring for production lines, new power feeders or improved wiring for higher capacities.

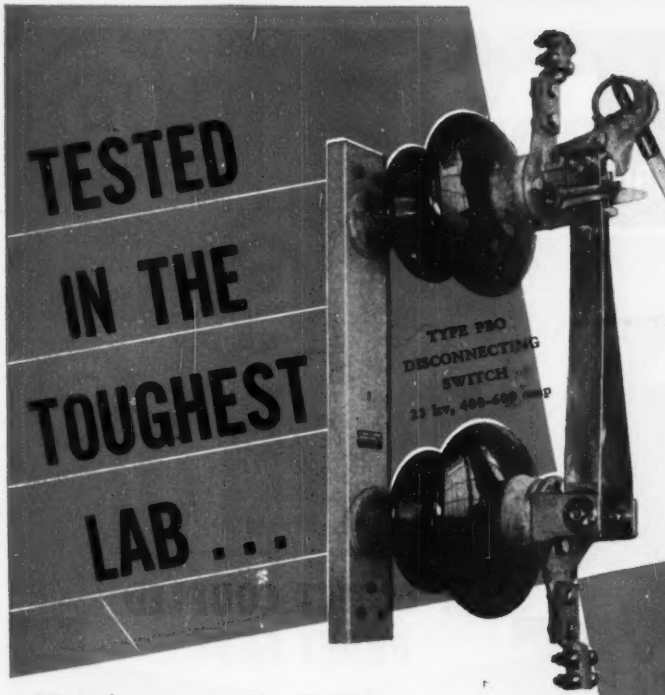
Although the rearmament program restricts the use of Aluminum we are ready to help you with the planning for trouble-free, low-cost wiring. For information write ALUMINUM COMPANY OF AMERICA, 1776G Gulf Bldg., Pittsburgh 19, Penna.

Aluminum Conductors

ALCOA

of ALCOA EC ALUMINUM are made by leading manufacturers

TESTED IN THE TOUGHEST LAB . . .



Southern States Type PBO Hookstick Disconnecting Switches have been thoroughly proven on thousands of applications in the field . . . *the toughest laboratory of all.* Easy operation, controlled contact pressure and sturdy construction give the type PBO a combination of vital features necessary for long, trouble free service.

Note these outstanding features:

- Extra large operating ring of heavy duty construction
- Automatic latch and blade pry-out
- Terminal pads with standard drilling on 1¾" centers
- Belleville spring washers at hinge and jaw maintain high pressure on double line contacts. Positive contact assured by wiping action of accurately machined surfaces.
- Trussed, hard drawn copper bus bar blades; double blade construction
- Rigid, wide flaring, cast blade guides
- Steel bases, hot dipped galvanized after fabrication are available to specification

Automatic latch closed showing positive engagement of latch. Cannot open under load. Latching mechanism is completely independent of operating ring. Extra large operating ring for easy hookstick insertion.

POSITIVE LATCHING — EASY PRY-OUT ACTION OF SOUTHERN STATES TYPE PBO

Latch clears under hookstick pressure. Pulling force applied to the ring from any normal operating position opens latch easily. Rugged latch construction, good leverage provide excellent ice-breaking characteristics.

Southern States Type PBO switches are available in all capacities from 400 to 3000 amps and 7.5 to 115 kv for all types of single pole, disconnect switch installations. The type PBO conforms in every respect to NEMA, AIEE and ASTM standards.

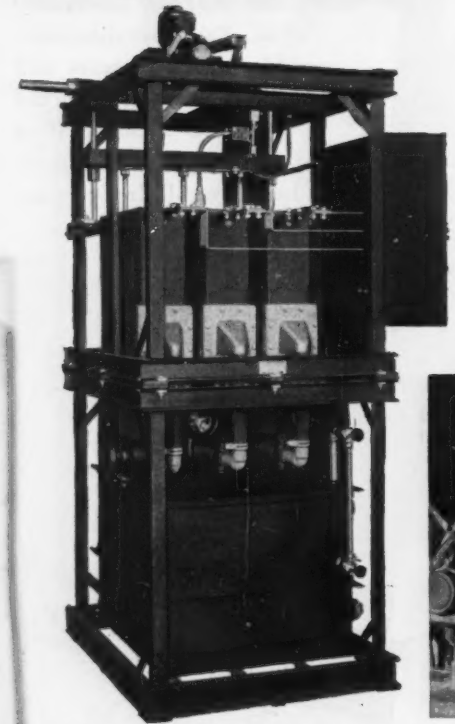
Write today for Bulletin No. 405 for complete engineering information on SS Type PBO outdoor, single pole, disconnecting switch.

Southern States Equipment Corp.
HAMPTON GEORGIA

ALLIS-CHALMERS
Liquid Rheostat
POWER PLANT CONTROL

Stepless Speed Control

OF DIRECT COUPLED DRAFT FANS



Speed of the direct coupled forced draft fans shown at right is controlled by remotely located Type 257 Liquid Rheostats.

FOR PROPER DRAFT CONTROL of boilers, use Allis-Chalmers Type 257 Liquid Rheostats in the secondary of wound rotor motors driving forced or induced draft fans.

Stepless speed control of Type 257 Liquid Rheostats is engineered to give straight line relationship between motor speed and rheostat electrode position. Equal sensitivity of speed control over the entire regulated range is assured.

Floor space is saved by compact design. Only electrical connections are required. Direct coupling of fans and driving motors simplifies bearing alignment and maintenance problems . . . saves space . . . insures continuity of service.

Low Maintenance. Type 257 Liquid Rheostats have but few moving parts . . . no arcing contacts. Electrodes can be actuated by electric, pneumatic or hydraulic operators and give full resistance range in approximately ten inches travel.

Call your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin for leaflet 14S7544. A-3423

ALLIS-CHALMERS

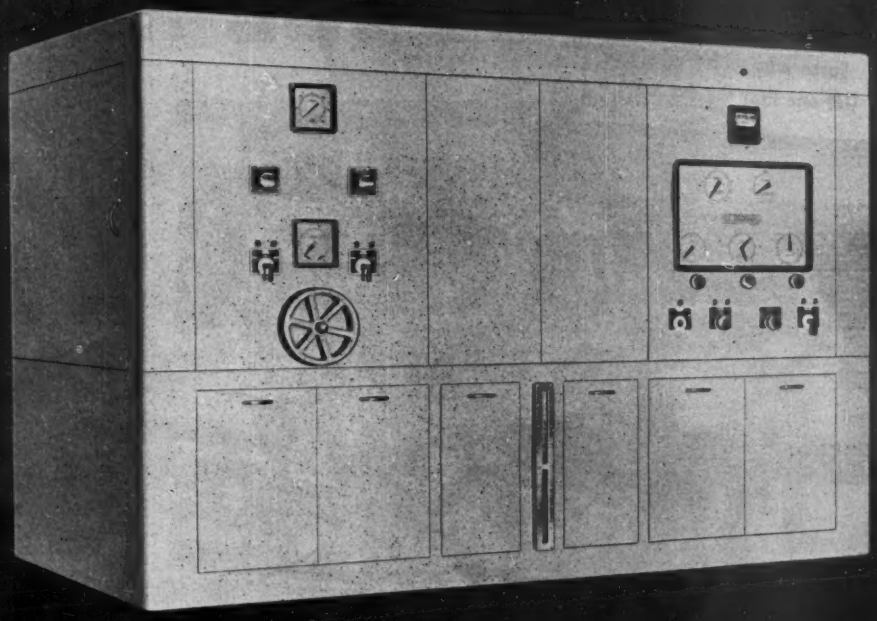
WOUND ROTOR PRIMARY MOTOR CONTROL

Make your Boiler Draft Fan Drive all Allis-Chalmers. Use the Type 257 Liquid Rheostat for secondary speed control, an Allis-Chalmers Type "H" Starter for primary control (bul. 14B6410A), and an Allis-Chalmers wound rotor motor.

ORDER TELEGRAPH SYSTEMS

The Allis-Chalmers Order Telegraph System is accurate and reliable . . . can be depended upon even during station power failure because it uses the dc bus for its power source. An alarm system operates until the order is returned correctly. Select either five or ten-inch semi-flush dials. Use it to transmit orders between switchboard and turbine room.

WOODWARD
GOVERNORS



CABINET TYPE ACTUATOR FOR CONTROLLING ONE OF FOUR 105,000 HORSEPOWER HYDRAULIC TURBINES FOR THE U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, HUNGRY HORSE POWERPLANT.

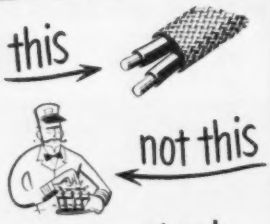
WOODWARD SERVICE

WOODWARD GOVERNOR COMPANY

ROCKFORD • ILLINOIS

World's oldest and largest exclusive manufacturer of hydraulic governors for prime movers

To transmit current, you need the right kind of conductor.



Same way with trucks. Get one that fits the job!

Slash hauling costs with dependable DODGE "Job-Rated" TRUCKS

Your utility business requires fast, efficient service at low cost. That's why you need a truck that fits your job . . . a Dodge "*Job-Rated*" truck!

Your Dodge "*Job-Rated*" truck will save time on the road with a power-packed engine. You'll save on oil and gas consumption. And you'll save on upkeep costs because your truck will *fit* the job!

Your Dodge truck will give you dependable year-'round service, too. You'll find new braking safety and easier bad-weather starting. You'll also enjoy new driver comfort and improved handling ease.

Ask your nearby Dodge dealer how a Dodge "*Job-Rated*" truck will save you money . . . last longer!

Exclusive! gyrol Fluid Drive!

Available on ½-, ¾-, and 1-ton models. Smoother performance and easier driving! Reduces wear and tear on over 80 vital drive-line parts! Reduces upkeep costs, too! Ask for a demonstration.

How Dodge trucks are "*Job-Rated*" for utility operations

A Dodge "*Job-Rated*" truck is engineered *at the factory* to fit a specific job . . . save you money . . . last longer.

Every unit from engine to rear axle is "*Job-Rated*"—factory-engineered to haul a specific load over the roads you travel and at the speeds you require.

Every unit that SUPPORTS the load—frame, axles, springs, wheels, tires, and others—is engineered right to provide the strength and capacity needed.

Every unit that MOVES the load—engine, clutch, transmission, propeller shaft, rear axle, and others—is engineered right to meet a particular operating condition.

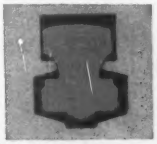
"Job-Rated" TRUCKS DO THE MOST FOR YOU

BURNDY-BUILT *to do an important job* BETTER

Comparison of Burndy Servit with other makes, reveals some striking advantages. The longer Servit head is easier to hold with a wrench. The pressure bar equals the length of the head and contributes much to Servit's higher pull-out strength. Servit is forged from high-strength silicon bronze alloy to afford exceptional durability without bulk. Furthermore, all Servits will give good results in service. Strict quality control on daily production runs keep Servit performance characteristics at a uniformly high level.

MORE CONVENIENT! — Won't stick up like sore thumb! Easier wrench grip!

SMALLER! — Servit shown against another split-bolt of comparable size.



BURNDY SERVIT

STRONGER! — Head and pressure bar of equal length — bar resists crushing!

TIGHTER! — Maximum tightening force transmitted into intimate contact between conductors.

BURNDY, New York 54, N. Y.
Western Branch: Vernon 58, Calif.
Burndy Canada Ltd., Toronto 8, Ontario

REASON for CONFIDENCE
. . . in Peace or War

. . . that's what the trademarks and brand names of American producers establish. For never has a country accumulated such wealth of designing and engineering talent, such monumental means for producing both the necessities and luxuries of the day, or such massive potential for meeting the needs of tomorrow—however vast and varied they may be.

Accordingly, we take particular pride in *our* personal emblem. Representing a wide range of alloys for the electrical, electronic and heat-treating industries, it is the very symbol of quality and dependability to a host of manufacturers thruout the nation. We are well aware of our obligation to uphold its reputation—in peace or war.

So if your products demand electrical resistance material of outstanding uniformity, high stability, and long life . . . or if you require radio alloys for electronic uses . . . or high heat-resistant equipment . . . *consult with us.* Our fifty years' experience is at your disposal.

As recipient of the highest Armed Services Award in 1918, and of no less than five Army-Navy "E" Awards in World War II, it is logical that the resources of this firm should be engaged to an unprecedented extent in meeting the demands of the present emergency. However, we stand ready to make recommendations based upon your specific requirements, and shall be glad to serve you to the best of our ability.

One thing is sure: Your use of a D-H product will prove a source of confidence—confidence not only in Driver-Harris products per se, but, in a wider sense, confidence in the capacity of creative America to meet any situation, *come what may.*

Manufacturers of world-famous Nichrome and over 80 other alloys for the electrical, electronic, and heat-treating fields.*

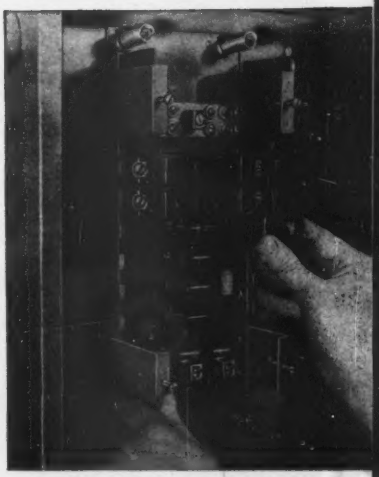
Driver-Harris Company

HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

*T. M. REG. U. S. PAT. OFF.



ANOTHER TALKING POINT IS THE BREAKER—Trumbull's new NLTQ Panelboard introduces the first *plug-in* circuit breaker with quick-make, quick-break operation. Other features: both *thermal* and *magnetic* protection . . . trip-free . . . pressure-type, silver-plated copper plug-in contacts . . . all ratings physically interchangeable. Adjacent breakers are on alternate phases—assuring balanced loads and circuits.

New insulating material

MAKES PANELBOARD SALES!

The base of this panelboard interior is made of *Plastisol* . . . the first time this amazing plastic material has been used for this purpose.

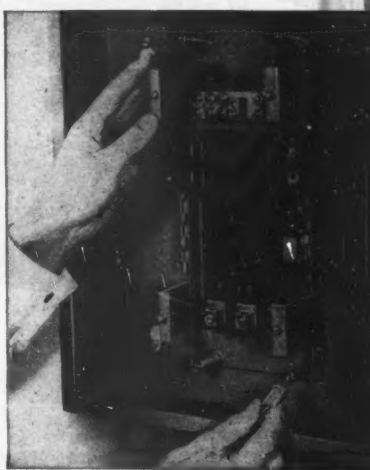
Here are some reasons for your recommending Trumbull's new NLTQ Panelboard to your customers.

Plastisol has very high thermal conductivity and is an excellent radiator of heat. Copper bus bars encased in Plastisol run 10% cooler than in open air!

SALES POINTS THAT OUT-SELL OTHER INSULATION

Other Plastisol advantages making it superior to all other types of insulation for this purpose include its ability to resist acid and alkali, high temperatures (not harmed at 212 F), tracking and carbonizing. It will not shrink or become brittle, even at minus 30 F.

Trumbull's Plastisol base is Underwriters' Laboratories, Inc. approved and endorsed by the Electrical Council.

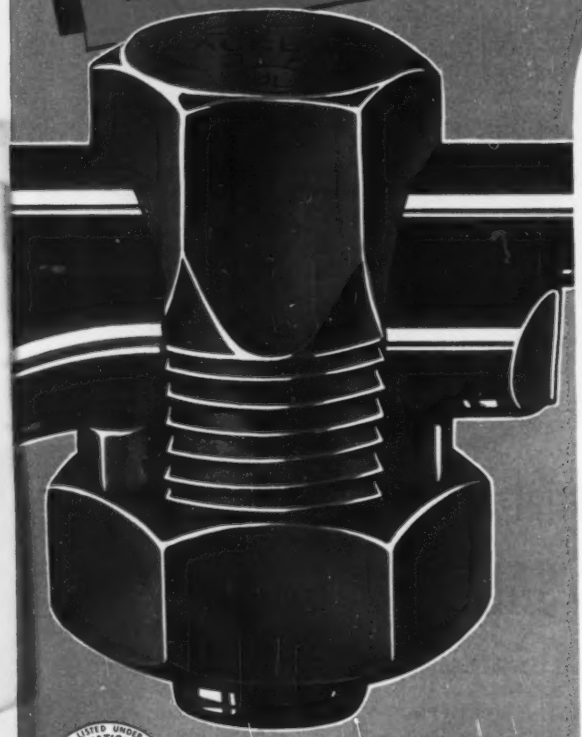


YOUR CUSTOMERS WILL LIKE QUICK INSTALLATION—Interior is mounted in box by compression springs . . . which permit easy release for removal. Springs also permit lining up fronts regardless of uneven box installation. Trumbull NLTQ panelboards with lug or circuit breaker mains come in capacities up to 225 amperes in a range of 4 to 42 circuits. Write for Bulletin TEB-14.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

These 2 Things Make a GOOD Connection!



1 High Pressure Contact Between Wires:

It is fundamental that **high pressure** contacts are **better** electrical contacts. Also, it is necessary to have high pressure to keep the wires from sliding, rolling or moving within the connector, as the power lines sway in the wind. High pressure effectively seals the contact surfaces from moisture and oxidation and produces a lasting low resistance connection. Tests show that BLACKBURN Connectors definitely produce these high pressure contacts.

2 Ability to Maintain This High Pressure Contact:

The connector must have sufficient strength to make and **hold** a high pressure connection. It must not yield or stretch and loosen up with time. BLACKBURN Hi-Strength Connectors are made of Duronze, a silicon bronze alloy which is actually stronger than structural steel. They have that **extra strength** so vital to a good connector.

YES, BLACKBURN Hi-Strength Connectors (1) make high pressure connections and (2) have that extra strength required to **hold** the high pressure connection. It pays to use the best—it pays to use BLACKBURN Connectors.

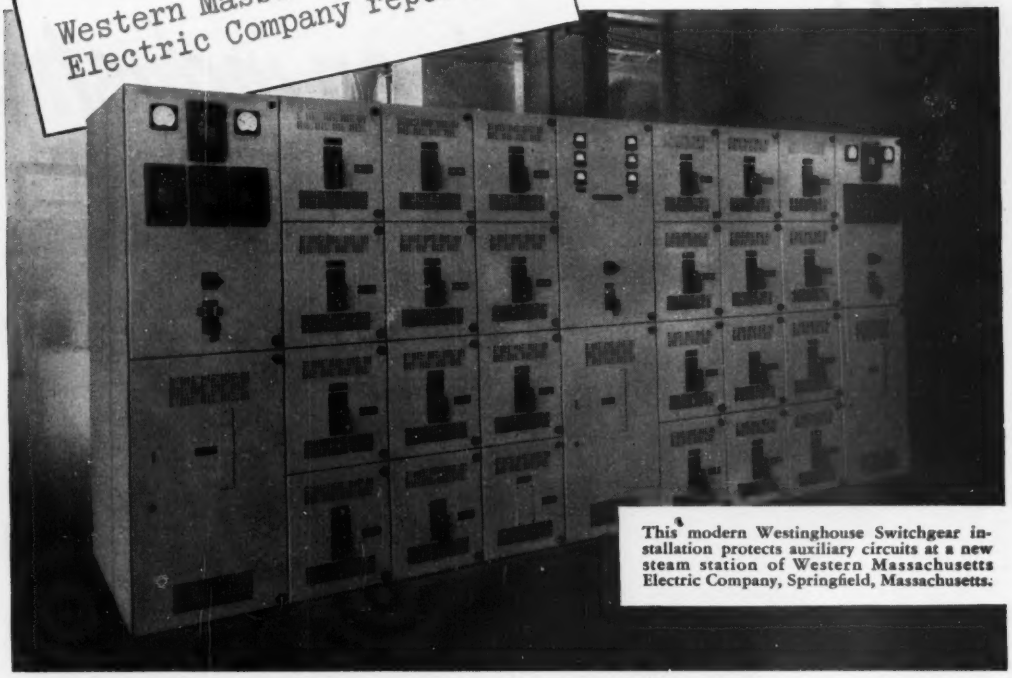
LISTED UNDER REEXAMINATION SERVICE UL UNDERWRITERS' LABORATORIES, INC.

BLACKBURN *Hi-Strength* **CONNECTORS**

JASPER BLACKBURN CORP.
35 MADISON ST., ST. LOUIS 6, MO.

Phone CEntral 3007

Western Massachusetts Electric Company reports...



This modern Westinghouse Switchgear installation protects auxiliary circuits at a new steam station of Western Massachusetts Electric Company, Springfield, Massachusetts.

"COSTS LESS to apply... to install"

The experience of Western Massachusetts Electric Company demonstrates how Westinghouse Low-Voltage Switchgear helps to reduce power control costs. Specifically, they report:

Use of factory-assembled, low-voltage switchgear in connection with the supply to station auxiliaries on our West Springfield plant resulted in appreciable savings in two ways:

1. *Use of standard factory-assembled switchgear simplified installation and effected savings in installation costs.*
2. *Where switchgear is located adjacent to equipment being supplied, it was possible to use feeder breakers to control some of the large motors; thus, eliminating special motor control equipment.*

For central station services, industrial plants or large commercial buildings, Westinghouse Low-Voltage Switchgear offers you this same safe, low-cost means of protecting vital electrical services.

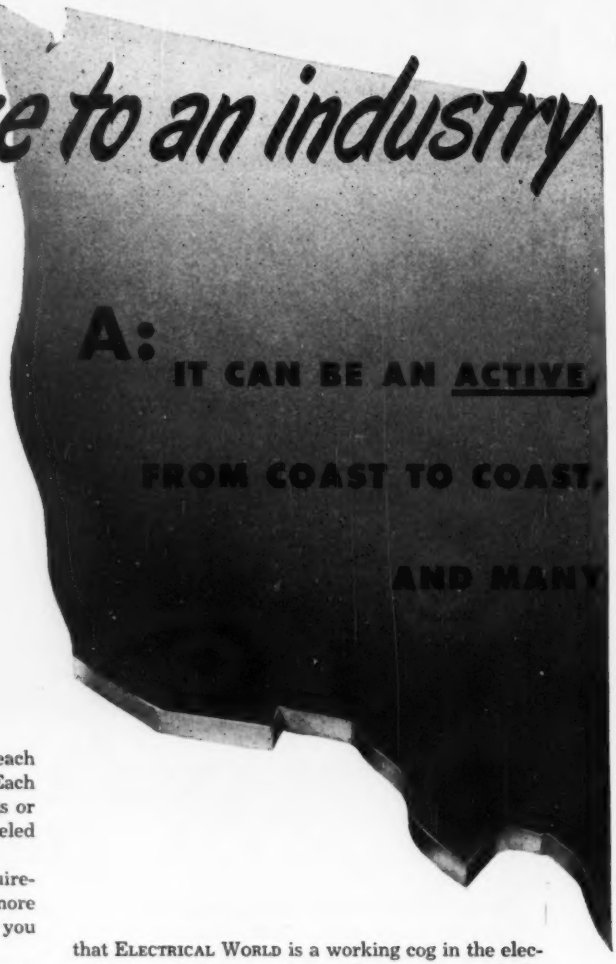
For complete information send for Booklet B-2296-D. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60754

YOU CAN BE SURE...IF IT'S Westinghouse

LOW-VOLTAGE SWITCHGEAR

Q: How close to an industry



ELECTRICAL WORLD's 12 traveling editors each covered an average of 15,875 miles last year. Each took part in an average of 20 industry meetings or conventions. That's a total of 190,500 miles traveled and 240 "editor-meetings."

Because of its great size and technical requirements, the electric power industry holds far more active organizations and special committees than you find in most industries.

ELECTRICAL WORLD editors cover all these meetings, but not just to sit still, listen and write reports. More often they are active participants indeed. At the request of the Edison Electrical Institute, for example, ELECTRICAL WORLD editors write, print and circulate "The Unconventional Daily," a daily newspaper containing registrations, candid photos, and all the news of the E.E.I.'s national convention.

In recent general meetings of the American Institute of Electrical Engineers, three ELECTRICAL WORLD editors were committee chairmen or committee members. At other important industry meetings last year, our editors were on the program more than a dozen times. Because of their wide contacts and objective viewpoints, the industry invited them to speak because they had things of importance and interest to say.

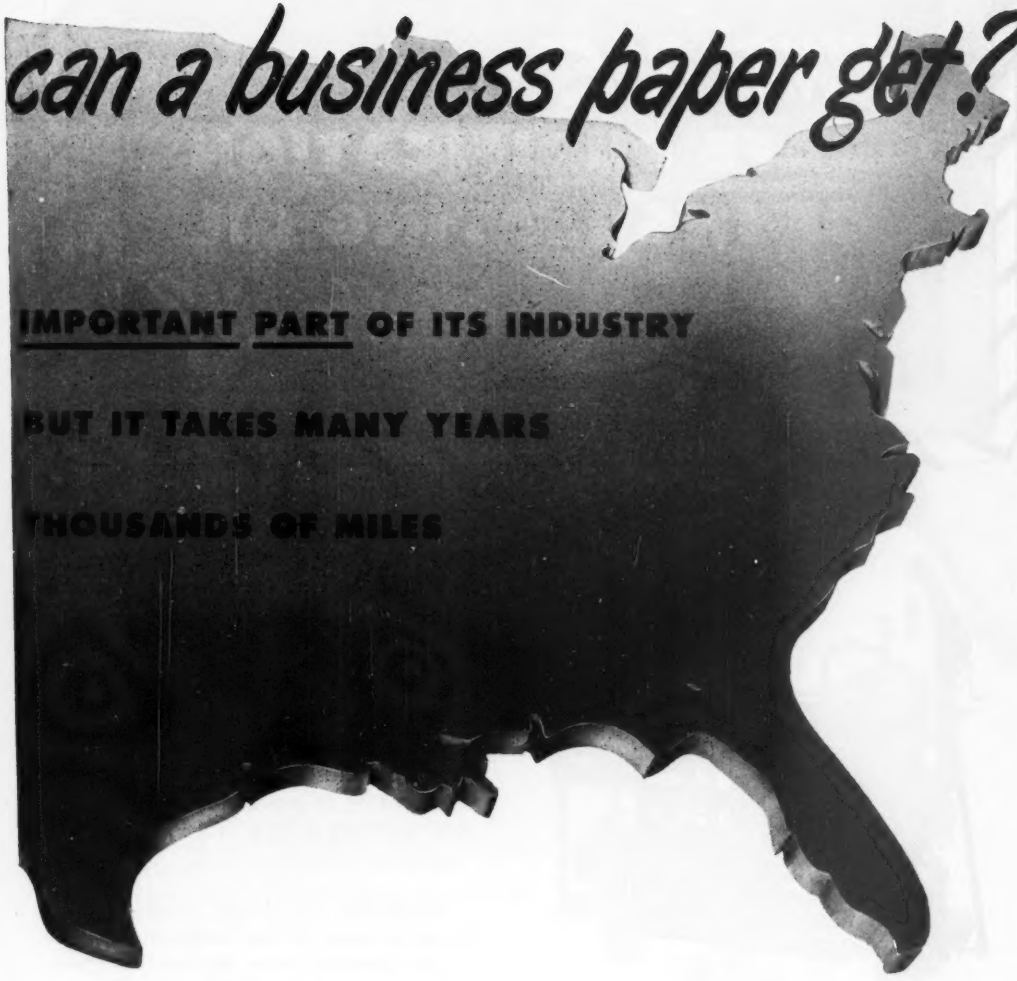
We could give many more examples. The idea is that ELECTRICAL WORLD is a working cog in the electric power industry, not merely an interested observer who listens and writes reports.

Working hard at this kind of participation for 77 years has earned ELECTRICAL WORLD an unusual place in the great-growth industry – more intimate and carrying more confidence than you ordinarily find in the relationship between a business paper and its industry Our editors are often asked to sit in on "closed" meetings of industry organizations and special technical committees.

Combined with the rest of ELECTRICAL WORLD's top editorial service, this all adds up to readership and confidence in the highest degree – the two most valuable things you buy in an advertising medium.

To inform and influence the electric power industry, which again this year will spend more money than any other industry on capital goods, tell the *useful* facts about your product in ELECTRICAL WORLD.

can a business paper get?



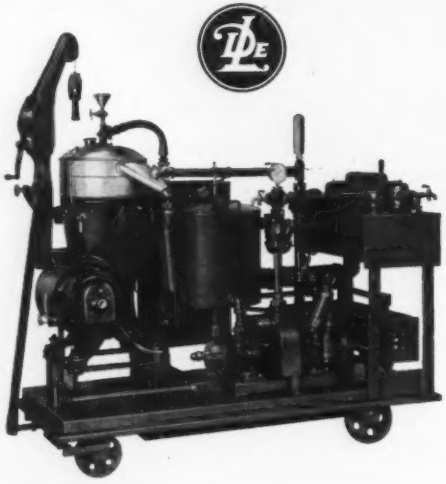
GOOD ADVERTISING PAYS IN **Electrical World**

JOURNAL OF THE GREAT GROWTH INDUSTRY FOR 77 YEARS

A McGRAW-HILL MAGAZINE
McGRAW-HILL BUILDING, NEW YORK 18

ABC • ABP

WHAT DOES SAFE PURIFICATION OF INSULATING OIL MEAN?



It means purification the ***De Laval*** way —so that water that has once been removed from the oil cannot recontaminate the oil.

De Laval purifies oil by means of centrifugal force, acting on the oil in the bowl of the machine. Action is instantaneous and positive—with a De Laval System you never take a chance that a batch of oil in process of being purified will go from a high to a low dielectric test in an instant.

Moreover, De Laval purification is accomplished at low temperatures; the high dielectric value of the oil is maintained for longer periods of time.

DE LAVAL

INSULATING OIL PURIFIERS

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

is your wiring like a camel's back?

ANACONDA "POWER UP" CAMPAIGN HELPS UTILITIES

HERE IS another advertisement in the Anaconda "POWER UP — And Be Prepared" campaign urging industry to make more efficient use of the power it buys from you. This Anaconda campaign is also being directed to contractors and wholesalers.

As in our previous industry-wide campaigns, we again offer advertisement reprints imprinted with your letterhead and message —for mailing to your industrial power customers.

9 out of 10 wiring systems are overloaded

That next piece of equipment you install may be the straw that breaks the back of your plant wiring system—if that wiring is inadequate and obsolete.

Inadequate wiring systems cost money. Every day they're causing cable failures, voltage drops and slowed production in 9 out of every 10 industrial plants. A modern wiring system gives you the full power you pay for . . . and protects you against possible power breakdowns.

Safeguard your production. A strong national defense requires full-scale production and modern up-to-the-minute power wiring systems that can deliver full power.

Make plans to survey your plant wiring system. Call in your utility, plant or consulting engineer or electrical contractor today. And by all means send for your free copy of *"Power Up—And Be Prepared."* It's a complete guide to modern plant wiring. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

51343

the right cable for the job **ANACONDA®**

WIRE AND CABLE

CRESCENT TOOLS
are shipped to tool users
ALL OVER THE WORLD
from THIS PLANT----

The Crescent Tool plant at Jamestown, N. Y. is one of the finest tool manufacturing plants in the world. It is completely up-to-date, with the latest modern machinery. That's why the Crescent Line of hand tools can be depended upon to do good work, quicker and easier.

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WRENCHES :: PLIERS :: SCREWDRIVERS :: HACKSAWS
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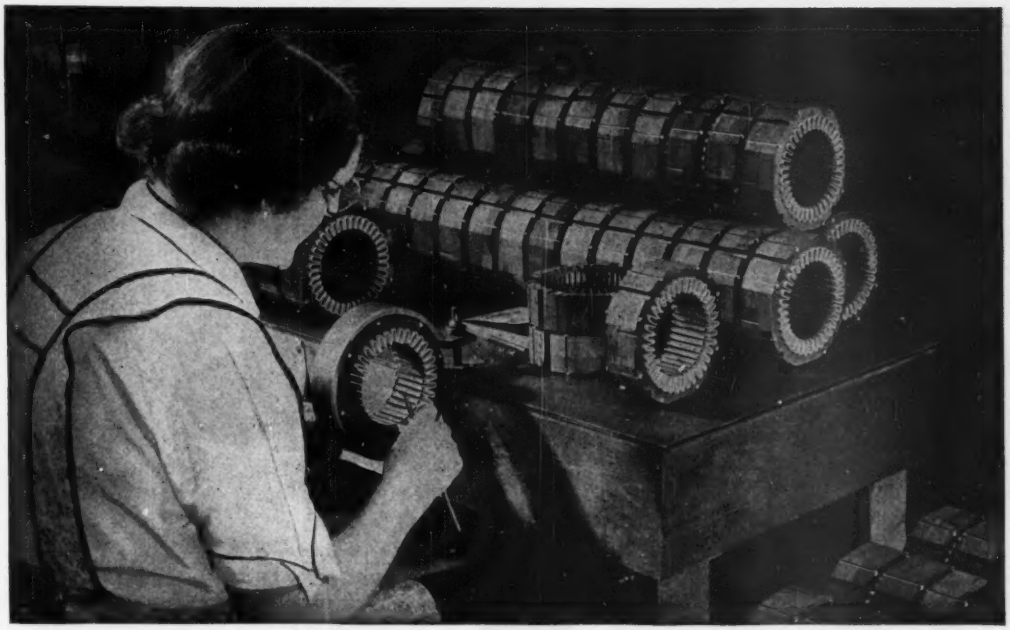
CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by Crescent Tool Company, Jamestown, N. Y.

CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence



"Motors with IRV-O-SLOT insulation give year after year of service"

The Kingston-Conley Division of the Hoover Company uses Irvington IRV-O-SLOT insulation on its famous line of electric motors. Mr. A. E. Ott, Sales Engineer at Hoover, tells why:

"The high quality of the paper backing used in IRV-O-SLOT insulation has been fully proved by the many years over which our motors give satisfactory service. We find, too, that Irvington's slitting facilities give us greater flexibility in selecting paper widths, and allow us to shorten up our scheduling cycles."

These are among the reasons why IRV-O-SLOT has been the choice of many an electrical manufacturer, ever since Irvington introduced it as one of the *first* combined varnished-cambric-and-backing slot insulations.

The IRV-O-SLOT line now includes insulation for every slot requirement. Backing papers combine high dielectric and mechanical strength with ease of forming. Bonding adhesive allows enough "give" to prevent rupture of varnish film. IRV-O-SLOT literature is yours for the asking—just use the coupon below.

Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

EWO-7/51

Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N. J.

Gentlemen:

Please send me technical literature on IRV-O-SLOT insulation.

Name.....

Company.....

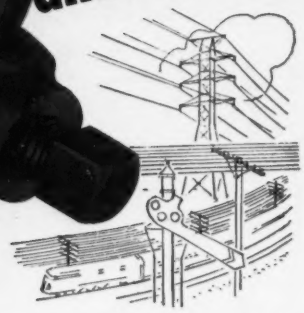
Address.....

City..... State.....

For LOW-COST LIGHTNING PROTECTION that's PERMANENT use Copperweld Ground Rods and Clamps

TRADE MARK

Struck 12 times during a single storm and 48 times in one year, the Empire State Building disproves the old saying that "lightning never strikes twice in the same place."



LOOK FOR THE NAME "COPPERWELD" – IT PROTECTS YOU!

YOU NEVER KNOW WHERE, WHEN, OR HOW OFTEN LIGHTNING WILL STRIKE . . . but you can secure safe, permanent and economical grounding protection when you install Copperweld* Ground Rods and Clamps. For every grounding application requiring the use of driven electrodes, these superior ground rods offer you these important advantages:

1. *Molten-Weld*—Permanent interlocking weld between the copper and alloy steel eliminates possibility of electrolytic action. No other ground rod has this inseparable union, accomplished only by the proved Copperweld Molten-Welding process.
2. *Ease of Installation* — Copperweld's extra-strong alloy steel core assures rigidity and easy driving even through very hard soils.
3. *High Conductivity*—Copperweld's thick sheath of pure copper provides excellent electrical conductance. Copper-to-copper contacts throughout insure low resistance.
4. *Protection Against Rust* — Copperweld's heavy copper armor permanently protects the alloy steel core against corrosion.
5. *Greater Economy* — Longer service life with no maintenance costs.

Start now to reduce outages and insure continuity of service by using Copperweld Ground Rods and Clamps. They provide safe, permanent, low-cost grounding protection at all types of locations—at poles, at towers, at power stations, at substations, at buildings — and for all grounding purposes.

COSTS YOU LESS — Copperweld — BECAUSE IT LASTS LONGER

MADE BY COPPERWELD STEEL COMPANY GLASSPORT, PA.

*Trade Mark

Stocked And Sold By:

HUBBARD AND COMPANY • JOSLYN MFG. & SUPPLY CO.

And All Their Distributors

±10% Regulation... in Sixteen 1¼% Steps

with New URL-16 Voltage Regulator — An Important Addition to the URL-8 Line

ASSURES MORE REVENUE FROM HEAVILY LOADED RURAL AREAS

Here's a new, low-cost answer to economical regulation in rural or suburban areas . . . at the substation or on the line. This new regulator increases the "URL" line for application in locations where a 10% range is not sufficient, and where a ±10% regulator is required. Sixteen 1¼% step operation meets these requirements under any load condition, at minimum cost.

Check these moneysaving features:

10% Regulation, Raise and Lower, in 16 Steps of 1¼% Each—Combines light weight for single-pole mounting with regulation for substation application. A double-purpose feature that cuts costs. Regulator retains every outstanding "URL" feature.

Simple Tap Changer, with Reversing Switch for ±10% Regulation—Cuts maintenance. Assures positive arc interruption and minimum voltage variation during tap changing period.

Package Control Mounted in Improved Control Cabinet—Operating relays are mounted in flexitest chassis. Separate resistance and reactance line drop compensator provides rated line drop compensation with regulator carrying only 67% rated load. All mounted in a cabinet with door hinged to provide workbench when fully opened.

For Further Information, call your Westinghouse representative, or write. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70602

YOU CAN BE SURE... IF IT'S Westinghouse

VOLTAGE REGULATORS

CHECK ALL THESE FEATURES...

...and you'll appreciate why there are more **LimiTorque** *Automatic Valve Controls in use, than all others.*

1. Micrometer torque seating switch.
2. Self contained unit—no gears, nut or bearings to buy.
3. Weatherproof, dust-tight and watertight construction.
4. Hammerblow device.
5. Non-rotating handwheel built into the unit.
6. Automatic declutching.
7. Motor is disengaged during handwheel operation.
8. Can always be declutched for handwheel operation regardless of weather or electrical conditions.
9. High torque motors.
10. Simple valve yoke.
11. May be mounted in any position.
12. Three to four times faster handwheel operation.

This Unit is mounted on top of valve yoke . . . Stem nut is inside and furnished with LimiTorque Unit. Nut is directly inside worm gear which drives it. (All clutches and connecting sleeves are eliminated.)

The LimiTorque is designed for plug, butterfly, gate and globe valves up to 96" diameter . . . Entire Unit and nut can be lifted off valve yoke, by removing flange bolts.

A special high starting torque motor, reduction gears, limit switches are all in one weatherproof assembly—and all electrical connections are made to terminal boards, easily accessible by removal of watertight cover . . . heat treated helical gears and hardened, ground and polished worm and bronze worm gear are used.

The usual Limitorque "hammerblow" device allows motor to reach full speed before load is engaged. This imparts the "hammerblow" necessary to unseat sticking valve.

Torque seating switch insures tight valve closure without strain on valve parts. Protection from damage due to a foreign object obstructing closing is provided during entire closing operation because motor is shut off by thrust exerted on valve disc.

Actuation may be by any available power source such as electricity, air, oil, gas or water.

Write for Catalog L-50 for complete details. Please use your Business Letterhead.

Philadelphia Gear Works, INC.

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NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

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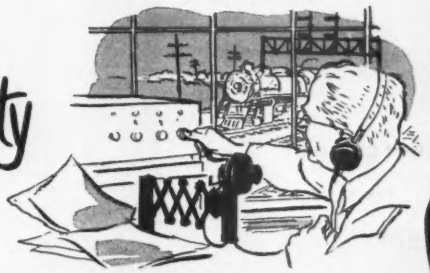
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

WATERPROOF. Control wires and cables for naval equipment resist salt air, water, heat, cold, mildew, oils and greases when insulated with VINYLITE Plastics.

HEAT RESISTANT. Police radio wiring insulated with VINYLITE Plastics is flameproof, heat resistant to 220 deg. F., withstands moisture, industrial fumes, aging.

Where Wire Dependability is a MUST . . .



CHEMICAL RESISTANT. Railroad signal wires and cables with VINYLITE Plastic insulation stay on the job despite corrosive atmospheres, heat, cold, storm, wind, snow and rain.

TRUST Insulation Made of →

Vinylite BRAND **PLASTICS**

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide & Carbon Corporation
30 East 42nd St., New York 17, N. Y.

WIRES insulated with VINYLITE Plastics have served seven years under water, twelve years buried under ground, without sign of failure. In chemical plants, refineries, machinery, electronic apparatus, they are widely specified because they last—and *long outlast older materials.*

Water, oils, greases, alkalies, most strong acids, sunlight, age, mildew, do not affect them. They may be made to stay flexible and tough down to —60 deg. F., or to keep their insulating properties up to 220 deg. F.

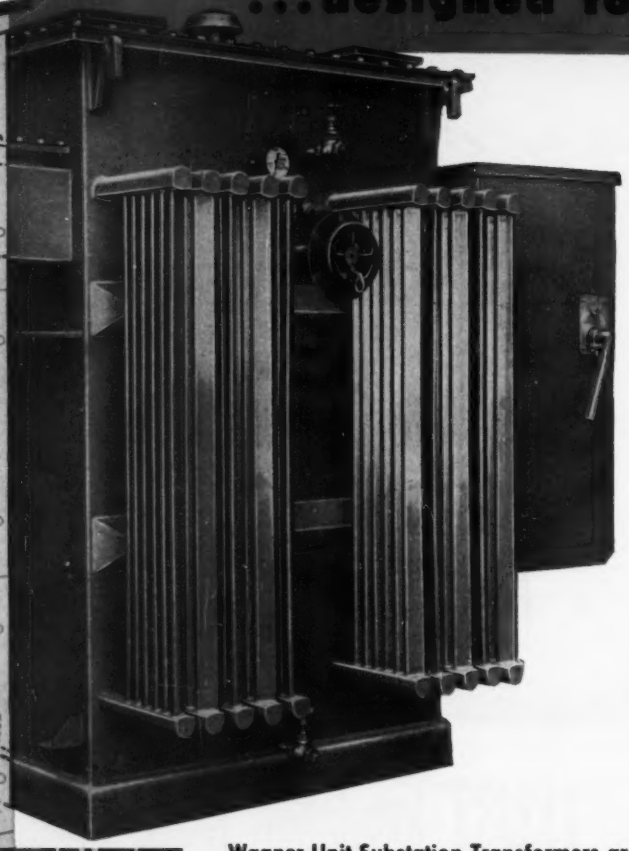
They permit smaller diameters, taking up less space. Their smooth surfaces pull easily around corners. They strip and splice with ease, and their unlimited range of lasting colors makes color-keying positive and permanent.

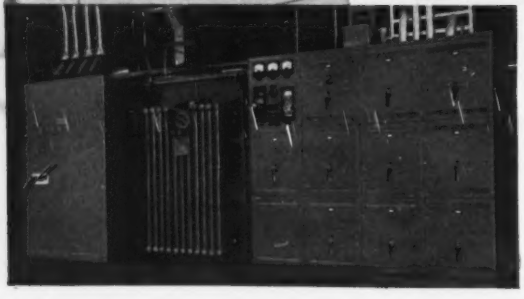
Attention of wire manufacturers is particularly called to VINYLITE Compounds for 90 and 105 deg. C. wiring for appliances, radio hook-ups, lamp ballasts, and machinery. For technical data on this or other versatile VINYLITE materials for specific wire and cable insulation, write Dept. KW-28

Wagner®
TRANSFORMERS
... the choice of leaders in industry

Wagner Unit
...designed for

switchgear to fit your needs





750 kva, type HPBN, 13,800 to 480 volt, 60 cycle, 3 phase Noflamol transformer in one of 14 Wagner-equipped unit substations in a large synthetic textile plant.

Wagner Unit Substation Transformers are in use in all kinds of industrial plants including: synthetic rubber, petroleum, steel, chemical, aircraft, automotive, paper, and many others. Bulletins TU-13 and TU-56 give full information. Write for your copies.

Wagner Electric Corporation
1891 WE 1951

Substation Transformers

plant power distribution systems

The ever-increasing demand for electric energy to power today's stepped-up production presents a critical problem. The answer to this problem has been found in load-center power distribution systems. Unit substations, located near the load, provide a flexible source of power at utilization voltages which is delivered to the point of use by short secondary feeders.

The vital part of the load-center system is the transformer. If a switch or circuit breaker fails, only a part of the system is affected—but if the transformer fails, the entire system is dead.

Wagner Unit Substation Transformers assure a continuous, dependable flow of power. They are carefully designed to meet your distribution requirements. Oil-filled and non-inflammable liquid filled (Noflamol) transformers are available with various types of entrances and controls for the high-voltage circuits, and with proper throats on the secondary side to connect to any make of switchgear, in the usual range of ratings up to 2000 kva.

The importance of the transformers in your plant power distribution system cannot be over-emphasized. Consult a Wagner-trained field engineer to help you solve your load-center problems. No obligation, of course.

Dry Type Indoor Transformers

in ratings from 100 to 2000 kva

To meet industry's growing need for larger indoor dry-type load center transformers, Wagner now furnishes three-phase dry-type transformers in ratings up to 2000-kva in the 15-kv class and below. Especially developed for plant power distribution circuits, these units are compactly housed in neat, attractive enclosures, which can be arranged to include primary and secondary switchgear compartments to form readily accessible, closely-coupled unit substations. Complete enclosure of all equipment protects against accidental contact with live parts. Relatively light in weight, so that they can be used in multi-story buildings, they are readily adaptable to any installation requirement.

WAGNER ELECTRIC CORPORATION

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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

T51-4

One of the two 610 hp CP Diesel engines operating at elevation of 2970 feet in Cartago, Colombia.

ANOTHER COMPLETE CP DIESEL ENGINE INSTALLATION IN SOUTH AMERICA

For its new municipal power plant, the City of Cartago, Colombia, after careful consideration, selected CP Diesel engine equipment consisting of two 610 hp, 514 rpm units, for driving 400 kw generators.

The entire plant, including building, accessories and provision for future expansion, was designed, engineered and erected as a single project, and then turned over to the City of Cartago ready for operation.

This is a typical example of how CP service can relieve a customer of all the technical problems and details involved in the design and installation of a complete Diesel-electric power plant.

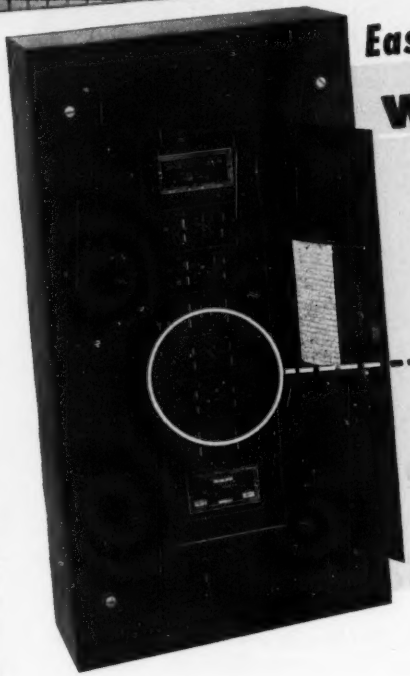
CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Easy to Add or Change Circuits

WITH THIS NMO "PLUG-IN" PANELBOARD



a "Natural" wherever a large number of branch circuits for lights, appliances and business machines must be switched and protected

1 SWING OUT...

2 OR LIFT OUT...

3 ATTACH WIRES...

4 "PLUG-IN"

Flexibility Four-circuit Multi-breaker units have "Plug-in" feature. Any combination of 15, 20, 30, 40, or 50 ampere circuits available. Dummy units can be inserted to anticipate future requirements. ***Easy to Wire***—Multi-breaker units can be swung or lifted out to attach wires. Approved connector eliminates "looping." ***Smaller Size***—Compact Multi-breaker unit permits more circuits and larger wiring gutters without increase in overall panel size. Better utilization of wall and column space.

THERMAL-*Calless* MAGNETIC BREAKER UNITS GIVE 2-WAY PROTECTION

Thermal Element responds to heating effects of both load current and surrounding atmosphere. Total temperature is limited to a safe value.
Magnetic Element responds instantly to heavy overloads or shorts.

BOTH Elements are needed for COMPLETE Protection!

Illustrated NMO Bulletin SA567R gives complete information on the new Panelboards. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

Elkonite* Contacts *Offer Cost-Saving Versatility*

Many Mallory customers have been helped to better contact performance at lower cost by Mallory engineering.

A joint investigation between Mallory and a manufacturer of industrial circuit breakers revealed that, because of an improvement in the breaker, the standard Mallory Elkonite being used for an arcing tip had a higher AR** factor than required. Mallory took the initiative and developed a new grade of Elkonite that more than met the service requirements . . . and at a substantially lower cost.

That's value beyond expectation!

This incident is another demonstration of Mallory initiative and the versatility of Elkonite by which a variety of performance and cost ratios can be secured by combining the properties of the constituent metals to precisely the right degree.

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

ELKONITE CONTACTS

Elkonite is the registered trade mark for a series of contact materials developed by Mallory and manufactured from metal powders. They are best known for their hardness, resistance to mechanical wear and impact, resistance to erosion by arcing (AR factor), and resistance to sticking.

Elkonite contacts are made by a unique and time-proved method which permits the combining of the desirable features of basic metals which cannot be alloyed. By this means, the high melting points of tungsten, molybdenum, or their carbides, can be combined with the current-carrying ability of silver and copper.

*Reg. U. S. Pat. Off.
**The ability of a contact material to withstand the erosion of an electric arc.

Electrical Contacts and Contact Assemblies

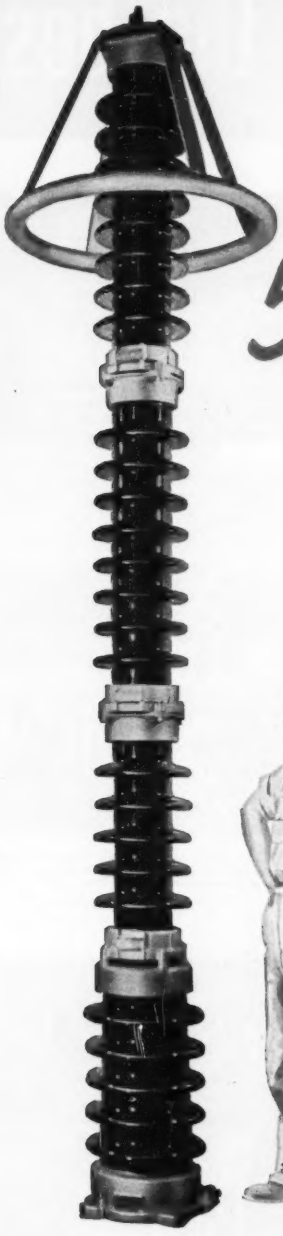
P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials



5 Reasons Why

this arrester gives you better service under any operating conditions

For lightning protection of power equipment, you want *proved* performance. This is the way we make *sure* about the performance of SV Station Type Arresters.

1. *It's "hot" lightning tested.* Every Autovalve block gets two 10,000-ampere surges superimposed on rated 60-cycle voltage to eliminate mechanical defects.
2. *It's "durability" tested.* A five percent sample from each batch of blocks receives at least fifty 10,000-ampere long-tail discharges superimposed on rated 60-cycle voltage as a minimum quality requirement.
3. *It's "volt-ampere" tested* . . . to assure that surge characteristics of every Autovalve block meet standard tolerances.
4. *It's "moisture" tested.* Complete arrester is tested with dry nitrogen at 30 pounds pressure to assure tightness of seals.
5. *It's "sparkover" tested* . . . to be sure arrester has been properly assembled, and will withstand its power voltage rating with considerable margin.

These careful checks eliminate possible imperfections in materials or manufacture that can cause faulty operation or failure in service. For complete information on SV Arresters write for D. B. 38-120. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60755

YOU CAN BE SURE... IF IT'S

Westinghouse

SV ARRESTERS

No. 3 - specify the best

★ *The Hi-Voltage Type C-W Air-Break Switch is the best available for substation work up to 69 kv. For ratings above 69 kv, specify Type L-W.*

The electrical, mechanical and design elements of the Type C-W have been co-ordinated with the best materials obtainable to provide something more than efficient operation. The Type C-W assures:

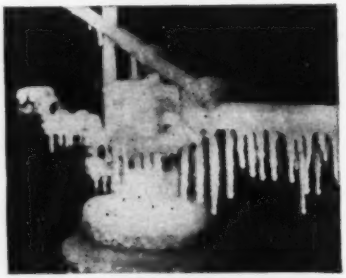
- **Life beyond the age of any substation**
- **Attractive appearance that matches the best of substation design**
- **Lowest possible installation cost**
- **Easy, certain operation**
- **Unmatched dependability**

Sleet, ice, years of standing idle have little effect on the operation of a Hi-Voltage switch. Certain operation is assured by the straight push-pull, close-open action of the switch arm. After clearing the contact housing, the arm is swung completely open by the powerful and precision-built operating mechanism.

And any Hi-Voltage design reduces switch installation cost from 20 to 40%, because the mechanism is completely pre-machined and pre-fitted at the Factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated.

Future advertisements in this series will discuss the merits of other types of Hi-Voltage Switches. In the meantime, ask your Joslyn Representative to give you the whole story.

Hinge end of C-W switch completely enclosed by a 6-hour deposit of ice. A gradually applied pull of 60 pounds on a 28-inch lever cracked the ice at the hubs of the crank and freed the mechanism.



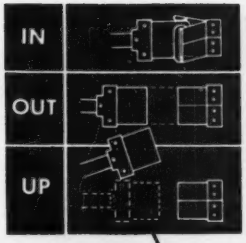
Contact end of C-W switch frozen in closed position by more than an inch of ice. Switch was opened without difficulty.

C-W switch being closed through a heavy deposit of clear ice. Switch was closed at the speed of motor operation. No difficulty was encountered because of the ice-breaking contact housing.

HI-VOLTAGE

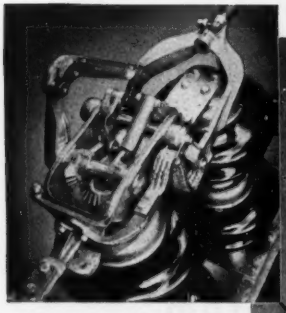
...type C-W air-break switch

IN-OUT SWITCH ACTION . . . Straight-line motion of the switch-arm provides positive opening and closing of the switch.

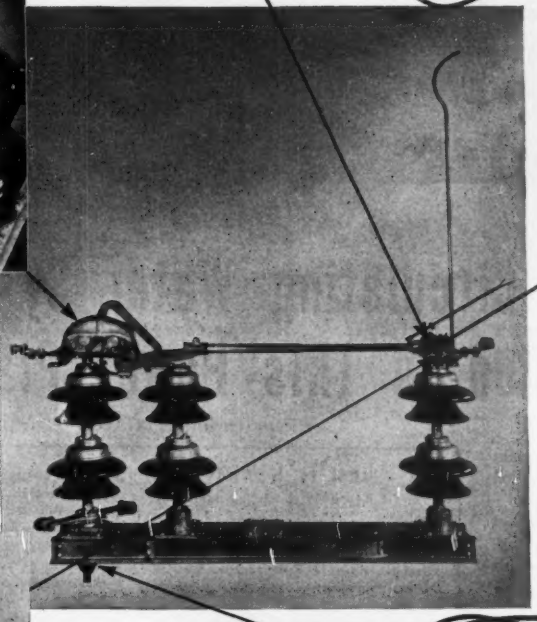


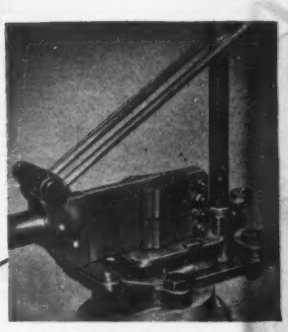
Hi-Voltage SWITCHES ARE AVAILABLE

from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.

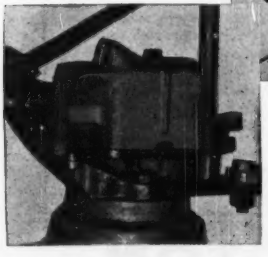


OPERATING MECHANISM is completely housed, very compact and exceptionally powerful. Every part is corrosion-proof . . . graphite insert bearings are used throughout . . . balancing spring is stainless steel . . . gears and cranks are bronze. There is nothing that can stick or bind, nothing to lubricate and nothing to adjust.

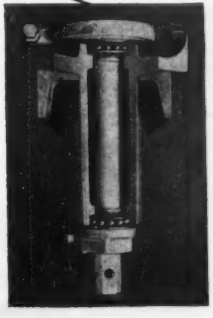




SILVER-NICKEL CONTACTS combine low resistance with low friction. Stainless steel springs maintain maximum conductivity.



CONTACT HOUSING protects contacts against sleet, dirt and arcing. Also, it acts as an ice breaker.



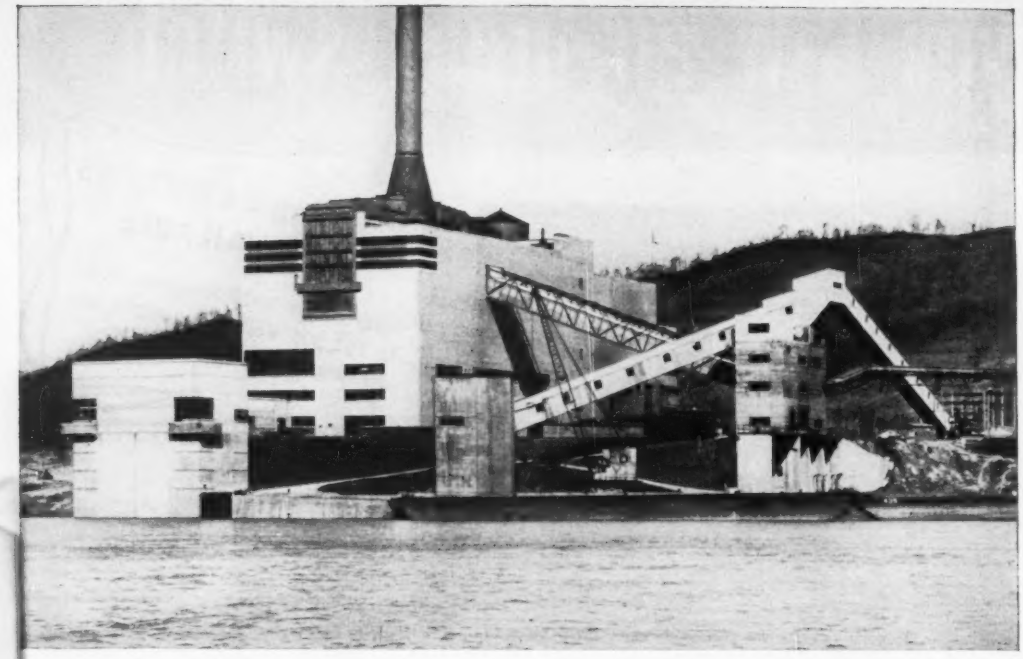
MAIN BEARING carrying rotating insulator is a forged steel spindle mounted in monel ball bearings and stainless steel races. Never requires lubrication.

ALSO AVAILABLE!

- Grounding Switches
- Manual and Automatic Control Mechanisms
- Mechanical Interlocks
- Hi-Voltage Fuses
- Cross-arms and Mounting Frames
- And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO



Unique Circulating Water System Installed in This Power Plant

The R. E. Burger steam-electric plant of Ohio Edison Company is located on the Ohio River well above flood stage—which may reach as much as 60 feet above extreme low water. Water is supplied to the condensers by a patented circulating water system pioneered jointly by Worthington and the consulting engineer, Mr. George W. Saathoff.

All major equipment except circulating pumps, which are designed to operate completely submerged if necessary, are located above flood stage.

The new installation of a Worthington 70,000 sq ft two-pass condenser and auxiliaries, serving a 90,000 kw turbine-generator, is the third Worthington unit in this station. Two 46,000 sq ft condensers were previously installed.

For advice on any new installation or information on a wide range of power plant equipment, consult Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, New Jersey.

HOW IT WORKS

Two full-capacity circulating pumps are used in series.* The primary pump, submerged below extreme low water, is a Worthington motor-driven HIFLO. Its high starting head characteristic is able to deliver enough water for starting purposes. A booster pump—a single-suction volute Worthington MIXFLO, mounted directly upon an hydraulic turbine—starts when there is enough water in the control well. The two pumps then operate automatically in series at full capacity.

Advantage is taken of maximum siphon effect from the condenser drop leg which enters the sealing or control well. From this well, all circulating water is passed through the hydraulic turbine. Thus the static head from sealing well to river level is utilized—75-80% being recovered—in reducing the work of the primary pump, with saving in overall pumping power.

The booster pump functions until rising water renders the turbine ineffective. Then the primary HIFLO works alone, producing full capacity under reduced head.

*In the new unit, there are two half-capacity primary pumps, permitting operation of only one in the winter when low water temperatures prevail.

Z.1.1

WORTHINGTON

WORLD'S BROADEST LINE OF STEAM POWER PLANT AUXILIARIES

Feed Water Heaters	Boiler Feed Pumps	Steam Turbines
Steam-Jet Ejectors	Water Treating Equipment	Surface Condensers

"Fourteen little superintendents . . ."

Fourteen little angels with eyes glued to the home movie screen. A well planned birthday party proceeding according to schedule. Then . . . pfft . . . and the projector stops. At once fourteen little angels change to fourteen little devils. Pity the poor host, a mechanical dud, trying to figure out what's wrong. Add fourteen little superintendents and a few assorted mothers, all anxious to take an active part—the perfect set-up for male frustration. When the repairman gets around—after a few days—and the trouble turns out to be electrical insulation failure . . . there goes a projector manufacturer's reputation, for a few pennies saved by using an inferior insulation.

Electrical insulation is a decisive factor in successful product operation.

Add extra protection and longer life to your products with BH Extra Flexible Fiberglas* Sleeving (Ex-Flex to the industry.)

Ex-Flex Fiberglas Sleeving has unusual non-fraying properties, obtained independent of the saturant. It can be cut in short lengths, yet will not fray in handling. Its tubular shape makes it easy to handle. It spreads readily over knobs, terminals and irregular objects.

Tough and long lasting, Ex-Flex Fiberglas Sleeving has perpetual flexibility, under all conditions of temperature and aging, because no hardening varnish is used.

Look at these other features too—available in colors—non-combustible—maintains physical and dielectric properties from —70°F to +1200°F, with color retention up to 300°F—resists abrasion and wear.

BH Ex-Flex Fiberglas Sleeving is one of a family of electrical insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements—product, temperatures, voltages—we will gladly furnish free samples for testing purposes.

Address Dept. W-7
Bentley, Harris Manufacturing Company
Conshohocken, Pa.

BH *Fiberglas SLEEVINGS**

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

"It has won my confidence over the years

That's why I Specify

ORANGEBURG"

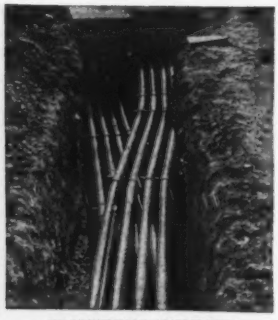
—says the Utility Engineer

Here are some of the reasons why this Utility Engineer, and many others like him, entrust their vital cables to Orangeburg for permanent protection.

• Will not corrode. Lasts indefinitely. • Impermeable wall and tight joints prevent corrosive ground waters from entering. • Lays faster and at lower cost than any other type of conduit. • Low coefficient of friction keeps pulling tensions on cable to minimum. • Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. • Resists acids, alkalis, grease, oil. • Light, easy to handle and tool on the job. • Tough, resilient—will not crack or break when properly handled.

ORANGEBURG NOCRETE

Installed *without* concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.



ORANGEBURG STANDARD

Installed with concrete encasement. The *preferred* conduit for banks of three or more ducts.

OUR NATION MUST HAVE UNINTERRUPTED POWER

One of today's great national assets is the continuous flow of power to industry, business and home. Every utility engineer knows that the unfailing supply of power depends on well protected cables. Cables always get that protection from Orangeburg Conduit. For 58 years, Orangeburg has successfully served the Electrical Industry because of its proved ability to provide a time-defying raceway for the permanent protection of electrical services underground.

And now as the Nation looks to the public utilities and municipalities to maintain and even increase their high standards of service, more and more of them are turning to Orangeburg Conduit. They are doing this because experience has made them sure that cables installed underground in Orangeburg *stay safe* and *keep the power flowing.*

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

NOCRETE Installed without Concrete

GENERAL ELECTRIC SUPPLY CORPORATION

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

GraybaR ELECTRIC COMPANY

STRONG DEFENSE
Against Power Failure...
Keystone Expulsion Arrester

You can't prevent lightning from striking your power lines, but you can get proved, dependable protective equipment to prevent power failure and costly transformer damage. The Keystone Expulsion Arrester with its important enclosed series gap and other exclusive features gives you advantages not found with other arresters.

The enclosed series gap assures consistent, uninterrupted operation. Because it is completely enclosed, this gap is unaffected by adverse weather conditions, birds, or other hazards. Vent passages assure that the body interior will remain dry at all times. Will safely withstand surge current discharges far in excess of standard test value of 65,000 amperes of approximately 5 x 10 microsecond wave shape.

Desirable, proved characteristics provide you with complete protection for power line equipment. Specify and use Keystone Expulsion Arresters

Get the latest technical data on expulsion type arresters and their installation. Write Dept. 1709 for Publication 431. No obligation.

ELECTRIC SERVICE MANUFACTURING CO.

PHILADELPHIA 32, PENNA.

Ionizing and De-ionizing Air Spaces

by

J. R. McFarlin, Vice President
ELECTRIC SERVICE MANUFACTURING CO.

Were it not for phenomena of ionization and de-ionization lightning arresters of the expulsion type now known would not be possible.

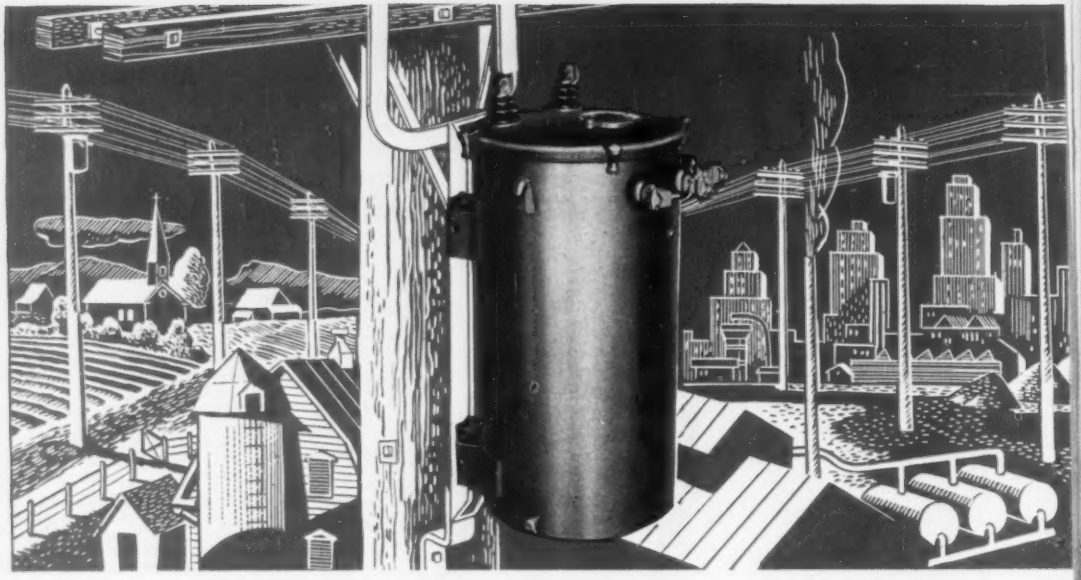
The removal of electrons from the atoms or molecules of a gas—such as air, produces ions; these ions distributed throughout an air path ionize it and make it electrically conductive; if means are available to decrease or remove these ions from the air path, the path will be de-ionized and will become electrically non-conductive. These two phenomena control the basic functioning of expulsion type lightning arresters.

When a high voltage or lightning surge attempts to flow through an expulsion type lightning arrester, the air in the discharge path becomes ionized and therefore conductive; and because of this the surge can flow from line through the arrester to ground; so can any system current that may follow the surge discharge to ground. The arrester will necessarily have either an external or internal series gap as a part of the discharge path and regions around the gap electrodes will also have ionized fields in their vicinity.

In order to interrupt the flow of follow current, de-ionization in the discharge path will have to occur; this can occur in various ways; the most prolific de-ionizing means is due to heat developed by the follow current being transferred to the surface of the fibre elements in the path and causing the release of large quantities of relatively un-ionized gas; this by mixing with the ionized air reduces the ionic density of the former, increases the resistance of the discharge path and so decreases the magnitude of follow current to a point at which extinguishment occurs. The foregoing clearly illustrates the phenomena occurring in the parallel discharge paths of the Keystone Expulsion type arrester.

Since the air surrounding the enclosed series gap of these arresters becomes ionized during arrester operation, means must be taken to prevent diffusion of these ions in the air path between the gap electrodes and grounded parts within the porcelain housing; this is accomplished by the "Ion Trap" which greatly retards ion diffusion into this space; due to this delay the ionized air becomes de-ionized by cooling and recombination and the normal condition of the arrester is quickly restored. The "Ion Trap" is the means by which the highly successful operation of the enclosed series gap in the Keystone Expulsion type lightning arrester is secured.

(*Advertisement*)



IT COSTS NO MORE TO BUY SOUND BASIC CONSTRUCTION

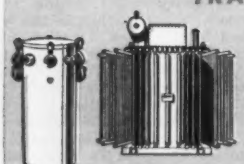
● Today, at The Standard Transformer Company, top-quality transformers are being produced for distribution systems all over the world — with no sacrifice of material for the sake of unimportant claims.

● Examine the Distribution Transformers illustrated on the right-hand page. Notice the easily removable cover, moisture-proofed with a Neoprene gasket to prevent oil leakage . . . note the rugged copper-bearing steel tank housing a low-loss core assembly of non-aging, varnish coated, silicon steel sheets . . . a coil that is wound in two sections to double heat radiation . . . ends that are not blanketed to induce free and effective oil circulation . . . a well-designed core clamping that assures quiet and efficient operation. These are some of the features that make Standard Transformers the best in their field.

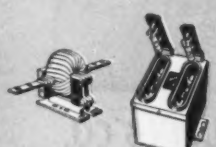
● It pays to buy sound basic construction. When you need transformer information, write for the name of your nearby Standard representative. He will help you with your selection, and describe our service fully.

. . . and remember . . . The Standard Transformer Company has built its reputation as a specialist in the design of transformers for every need. ● You write the ticket . . . Standard engineers and craftsmen comply with your specifications or requirements. You have complete freedom in your choice of accessories, such as Cubicles or Switchgear for Load Center or Substation Transformers, or other types that require them.

TRANSFORMERS FOR EVERY APPLICATION

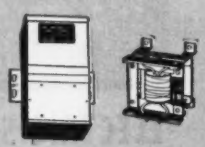


Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)

Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

Standard

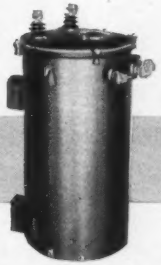
TRADE MARK ®

DISTRIBUTION TRANSFORMERS

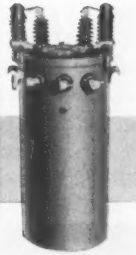
● Shown here are seven liquid filled Distribution Transformers 7½ to 75 KVA. Standard manufactures a complete scale of Transformers up to 15,000 KVA.

Type A Distribution Transformer, single phase, 60-cycle, sizes through 7½ KVA, voltage 2400/4160Y to 120/240, with pocket mounted, high voltage bushings.

Type A Distribution Transformer, single phase, 60-cycle, sizes of 10 and 15 KVA, voltage 2400/4160Y to 120/240 or 240/480, with pocket mounted, high voltage bushings

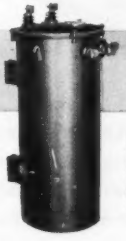


Type A Distribution Transformer, 37½ KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.



Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 7200/12470Y to 120/240 volts, 60-cycle, single phase with cover type high voltage bushings. ASA standard

Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 2400/4160Y to 120/240 volts, 60-cycle, single phase with two pocket type high voltage bushings ASA standard



Type A Distribution Transformer, 50 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings

Type A Distribution Transformer, 75 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.

Write for Bulletins covering the complete Standard line.

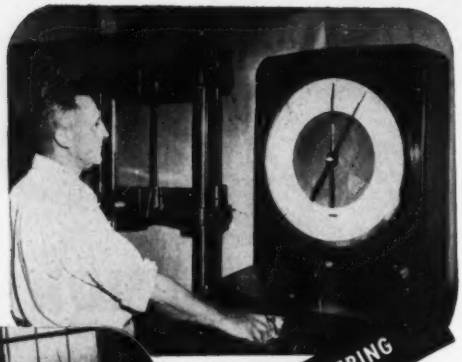
THE STANDARD TRANSFORMER CO.

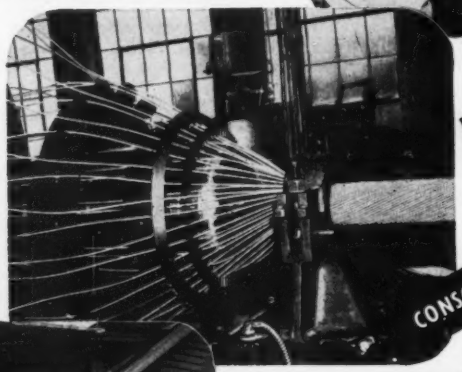
WARREN • • • OHIO

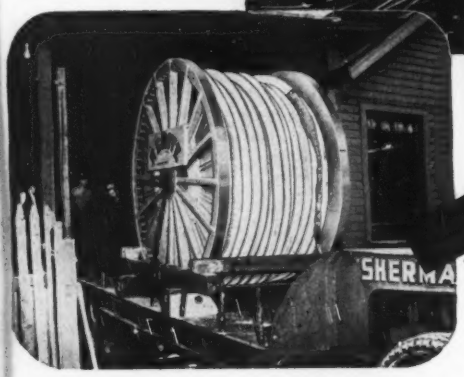
(REPRESENTATIVES IN PRINCIPAL CITIES)

3 way protection

insures the long-life inherent in Kerite Cable







FINE ENGINEERING

CONSCIENTIOUS WORKMANSHIP

CAREFUL HANDLING

Kerite's 3-way protection of *quality*—through the finest possible engineering, workmanship, and handling—insures you a 3-way service benefit—the safety, reliability, and economy that are inherent in the insulation itself.

Whether it's a special cable or one for the standardized circuits of power-plant and signaling operation, Kerite welcomes the opportunity to consider your requirements in the light of nearly a century's experience applying the exclusive Kerite formula to vital cable services.

THE KERITE COMPANY, 30 Church Street, New York 7, N. Y. Offices also at 122 Michigan Avenue, Chicago; 582 Market Street, San Francisco; 3901 San Fernando Road, Glendale 4, Calif.

KERITE CABLE

Kerite Insulation—Your Cable's Best Life Insurance

Editorials

The Deacon's Masterpiece

That epitome of coordinated design, "The Deacon's Masterpiece. . .the wonderful one-horse shay,". . . with its every part as strong and as durable as every other part, could well be the model for today's power supply systems, according to J. H. Foote, president of Commonwealth Associates. This was the sane conclusion and the humorous jibe of this expert on power system planning in a speech before the Electric Club of Los Angeles recently.

Utility management can look forward confidently to a demand for electricity that will continue to grow and grow in the years ahead. In such a situation even the most conservative utility executive must not overlook the necessity to add to and build his electric system facilities.

The challenge in the situation, according to Foote, lies in the fact that although great strides have been made in technical phases of power production, transmission, and distribution in the past decade and a half, opportunities for further improvement in efficiency are decreasing. This, coupled with today's increasing cost of labor and materials, poses a challenge to the power supply engineer . . . and to all utility management.

The law of diminishing returns seem to make it more and more difficult to expect a realization of more than 40 to 45% overall efficiency in power station economy in the foreseeable future, according to Foote. This represents a potential lowering of the fuel component of cost of production of not more than 10 to 20% over that now available in the very newest plant design. Costs of production plant labor and fuel, even when advantage is taken of technical developments in design and size of units, have increased more than efficiency has increased. He also feels that little change can be expected in the facilities available for the transmission and distribution system.

Since the future progress and economic soundness of the electrical utilities as of all industry depend upon technological improvements, new fields for investigation must be sought. Certainly, the possible use of nuclear fuel cannot be discounted. But aside from such singular examples, where will the design engineer find a rich source of technical improvement to assure continued progress in the art?

As Foote sees it, a lucrative field for study will involve a thorough balancing of the performance of all components of the system, design for reliability and dependability, and extension of the useful life and concurrent reduction in maintenance of all items making up the electricity power supply plant.

Thus we arrive at the power system design engineer's specification for "The Deacon's Masterpiece."

Concerned, But Not Too Much

Further evidence that the electric utilities are concerned, but not too much, about a shortage of engineers comes in the report of a survey conducted by the student branch of the Illuminating Engineering Society in the College of the City of New York. Letters applying for employment and including resumes of courses taken were sent to 315 prospective employees, among which were 107 electric utilities. These were bona-fide applications and the recipients of them did not know their replies would figure as data in a survey.

Replies were received from 72 utilities, 67.2%. Of the 72, 16 contained offers of employment, 45 indicated interest without making definite offers, and 11 were turn-downs. Taking the non-replies and the turn-downs together, it appears that one out of three utilities is not bothered about the availability of engineers.

This is a different picture from that shown in "Electrical World," May 21, p 130. Here, in answer to the question, "Do you need engineers now?", five out of six utilities said they did. It is quite probable that the difference between the ratios of one in three and one in six was caused by the nature of applications in the CCNY survey.

The applications stated preference for employment in the field of illuminating engineering. But the resumes of education showed the applicants had taken sufficient courses in the power phases of electrical engineering to qualify them for work in that line.

One conclusion in the survey report is that it is mostly the larger utilities that realize the need for engineering graduates. Another is that the beginning engineer should avoid indicating desire to specialize, anyway not in lighting.

Good Community Relations Pay Off

The people of Muskogee, Okla., recently voted 4,847 to 304 to renew their electric franchise with Oklahoma Gas & Electric Co. This public approval of service rendered by a private power company in itself is impressive.

But the Muskogee vote assumes real significance in view of the proximity of government-owned electric facilities. Ten miles to the north of the city is the 49,200-kw Fort Gibson project, nearing completion. Also under construction is the 34,000-kw Ten Killer Dam, about 25 miles from Muskogee. A 66-kv line of the Grand River Dam Authority runs 60 miles from the 72,000-kw Pensacola Dam to the city line. In addition, Southwestern Power Administration recently established its operating headquarters in the city.

In this atmosphere of public power, the Muskogee vote was anything but accidental. To point up the franchise issue specifically, OG&E ran newspaper ads and presented a film on private power before the vote was taken. But more important than this, the company for many years has advertised in its entire service area that it "desires to be a good friend and neighbor." Through personal contacts with customers, the 143 OG&E employees in Muskogee personalized this spirit before and during the franchise campaign. As one employee said after the election, "We started working on the franchise vote 25 years ago."

For the industry the success of the campaign of the Oklahoma utility (16-1 in favor of renewal of the franchise) points to the fact that public power can be licked. What is more it can be overwhelmed in a territory which should be most favorable to it. But such success does not come easily to a private utility and definitely it does not come quickly. Practically every company in the nation will have to fight for some franchise in the next quarter century. The time to begin that fight is now and not a few months before the election.

Can Co-ops Serve Industry?

Let's examine the position of a smart, ambitious, young co-op manager who wants to promote industrialization. He has completed coverage of his territory and is looking for more business. Certainly this is a commendable attitude on the part of "our" young man. The industry needs that kind of thinking. But let us analyze this idea which seems to be gaining in interest among the co-ops.

Historically and up until the present period of high-cost labor and equipment, industry could compete with utilities on power costs. Thus industry often made contracts for power supply at rates little above production cost. Then price of equipment, fuel, and wages went up until it reached a point where it became no longer feasible for an industry to install its own facilities. The rates of utilities, based upon original cost of equipment installed at lower prices plus the economies of a large system, gave them a big advantage. Unless industries need process steam or very large quantities of power, they can no longer afford to put in their own facilities.

What does this mean to co-ops? An industrial customer of any size could build its own facilities as cheaply as a co-op. So there would be no incentive to buy power from a co-op. The industrial could probably buy from a large system at a lower price and be assured of that interconnected system's dependable power. The co-ops would be smart to leave the large industrials to the power companies.

Small industry is a different matter. If co-ops could attract this load to their territory, they could increase the system load factor and secure the increased energy at a low incremental rate. This would be profitable to the utility supplier as well as the co-op. But even this idea has two severe limitations. The supply of power to industry requires service and engineering. Appropriate arrangements to secure this talent from supplier, consultant, or staff additions must be made. It is also becoming clear that when co-ops are finally taxed, the amount of sale to non-members will be one of the deciding points. Do they want to lose this advantage for the privilege of expanding into the industrial field?

The Electrical Week

INDUSTRY MOBILIZATION (pages 88 and 89)—Copper shortages are a big headache for government officials trying to maintain heavy equipment production schedule . . . Depa boosts material allotment to REA co-ops . . . East Coast plants will be required to convert to coal if Iranian oil supply is cut off . . . Amortization permits are listed on Page 88 and Industry M orders on Page 89.

WASHINGTON—Senate takes hefty swipe at USBR budget as debate continues on Interior appropriations bill (p 90) . . . Committee on the New England Economy recommends changes in government's power policy (p 92).

ELSEWHERE—Strikes stop construction at Shawnee and Joppa plants that will supply Paducah atomic energy plant (p 90) . . . Yields on utility bonds are still rising (p 91) . . . New York Farm Electrification Council stages a golden jubilee (p 93) . . . Pacific Southwest power margins, fairly safe now, are predicted to reach minimum by 1952 (p 94) . . . Two largest cranes on inland rivers of America are put to work to build Ohio plant (p 95).

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Philadelphia Electric Co announced it had upped specifications for a second unit ordered for its Colby Station in Phoenixville to 200,000 kw. This will make it the largest single-shaft unit in the world. Previous spec called for 150,000 kw, same as unit No. 1. No. 2 is scheduled to go on the line in the fall of 1954.

Experimenting with its electronic system, Radio Corp of America last week started telecasting Howdy Doody in color. CBS has been putting out a tri-colored Arthur Godfrey for three weeks on an FCC-approved commercial basis, and so the battle continues. RCA declined to predict when it would ask the commission to review its method for commercial licensing.

This country will get 45% of the tungsten and 78% of molybdenum allocated by the International Materials Conference for the third quarter. This was the first agreement of its kind reached by the conference, which is exploring shortages of key materials caused by mobilization.

National Production Authority ordered steel mills to earmark 95% of all ingots for military and essential civilian concerns holding CMP allotment certificates.

For his work as director of the project for rezoning New York City, Clifford R. Beardsley of the Defense Electric Power Administration has been awarded a plaque by the city's civil service workers. The former Consolidated Edison executive was cited by the workers' newspaper which made the award for "having developed a blueprint of the New York of the future based on keen analysis of the present."

Since the end of the war Pacific Gas & Electric Co has increased its hydro capacity by 362,108 kw and its steam capacity by 711,522 kw. From now until the end of 1954 another 33,000 kw of hydro and 1.2 million kw of steam are scheduled to go on the line. This is a grand total of 2,306,630 kw.

Southern California Edison can claim a record for speed in putting its second Big Creek Plant 4 hydro unit in operation. The 42-mw unit was released for commercial operation just 36 hours and 28 minutes after the first time it was rolled.

Stocks of coal on hand at electric utility power plants on June 1 totaled a record 34,652,915 tons, 64.6% more than a year ago. Based on May consumption this was a reserve of 134 days.

Quoddy tide power possibilities continue to rise and fall. U. S. engineers plan an electronic study of the sea bottom this summer with the hope that the cost of the proposed $3.9-million economic survey by the International Joint Commission can be cut.

"Questions and Answers about CMP," based on a series of meetings with business men, are available from the National Production Authority, Washington 25, D. C. The 80 questions answered in the booklet were the ones most frequently asked when the Controlled Materials Plan was being explained by traveling groups of government experts.

NOTES ABOUT PEOPLE—Willis D. Gale has been named president of Commonwealth Edison Co and its subsidiary, Public Service Co of Northern Illinois, in a major shuffle of the two companies' executive staffs. John W. Evers, Jr, became executive vice president of Commonwealth Edison and H. P. Sedwick executive vice president of Public Service. Both are new positions.

FRANCIS A. KOLB, Cleveland Electric Illuminating Co, is special assistant to Depa administrator

ROBERT N. TATE is chief of the Internal Combustion Engine Section of NPA's Engine and Turbine Division

Copper Shortages Plague Controls Officials, Threaten Utility Expansion

Copper shortages are the big headache for government officials trying to provide sufficient metals to maintain the production schedule for heavy electrical equipment.

CMP helped to increase the third quarter supply of copper slightly for engines, turbines, and generators. But the new allocations system has meant no increased copper for transformer, busbar, switchgear, and pole-line-hardware production.

Curtailed production of these items, as now appears likely, could seriously interfere with the whole electric power expansion program. Controlled materials provided for the power plants and the transmission systems would be wasted unless materials are also available for these vital links in the system.

Bonnell W. Clark, director of the National Production Authority's Electrical Equipment Division, told EW, "We are seriously short of copper in all forms. I am still hoping for a supplemental allocation."

E. J. Hand, deputy director of NPA's Engine and Turbine Division, reported CMP had helped a little, but lack of copper is still the top problem.

Neither of the men would spell out their needs percentage-wise. But it was determined their allotment of copper was much less than 90% of their requests.

Defense Production Administration, which slices the controlled materials pie, said it had made 40% cuts in copper requests for many civilian industries. But it is not believed the cut for electrical equipment requests went that deep.

Steel made available to the two NPA divisions is about 10% less than requested, and aluminum falls short of requested amounts by more than 10%.

Third quarter controlled material allotments for the Electrical Equipment Division are copper, 131,497,000 lb; steel, 566,410 tons; and aluminum, 26,488,000 lb.

For the Engine and Turbine Division: Copper, 12,720,000 lb; steel, 621,350 tons; and aluminum 3,271,000 lb.

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Order Cold Rolled Sheets to Speed Steel Delivery

Sheet steel of 14 gauge or lighter may be easier to obtain if ordered cold rolled rather than hot rolled, according to information given by the National Production Authority to manufacturers of electrical outlet boxes.

As a possible means of conserving metal, Underwriters Laboratories, Inc, is testing 16 gauge steel in place of 14 gauge for outlet boxes, the manufacturers reported.

Depa Boosts Materials Allotment to REA Co-ops

Rural Electrification Administration shared the increased third quarter allotment of materials given to other segments of the electric power industry.

Defense Electric Power Administration, the claimant agency for the electric utilities, doled out the increase to REA, which, in turn, is passing it out to the rural cooperatives.

Still short of demands, the additional allotment is expected to take care of a number of projects, which REA has said were in "acute need."

For REA cooperatives, the third-quarter controlled materials picture shaped up like this:

Increased copper allocation of 122,782 lb brought the total third-quarter allocation to 4,727,103 lb. REA originally requested 7,187,000 lb.

Increased steel allocation of 771 tons brought the total to 7,609 tons. Original request had been 8,746 tons.

Increased aluminum allotment of 4,410,841 lb brought the third quarter total to 12,893,227 lb. Request had been for 14,929,000 lb.

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Amortization Permits

The Defense Production Administration has issued certificates of necessity to a number of utilities permitting them to depreciate for tax purposes a designated percentage of the cost of new facilities in a 5-year period. Companies awarded certificates, amounts covered, and percentage of amortization allowed as follow:

Appalachian Electric Power Co—six plants, $2,743,240 at 25%, $212,300 at 25%, $16,210,450 at 25%, $47,939,310 at 65% and 45%, $1,873,700 at 45%, and $774,030 at 25%.

Ohio Power Co—four plants, $12,074,925 at 65%, $19,197,630 at 25%, $55,534,275 at 65%, and $4,639,950 at 45%.

Indiana & Michigan Electric Co—four plants, $661,179 at 25%, $20,928,340 at 25%, $17,468,691 at 45%, and $1,748,840 at 45%.

Southwestern Public Service Co—three plants, $216,670; $4,394,169; and $263,568; all at 25%.

Potomac Electric Power Co—$9 million at 60%.

Cleveland Electric Illuminating Co—$19,619,495 at 25%.

Northern States Power Co—two plants, $3,320,100 and $1,662,350 at 25%.

Monongahela Power Co—three plants, $34,504; $47,790; and $12,097,800; all at 25%.

Marietta Electric Co—$177,282 at 25%.

Montana Power Co—$5,410,000 at 25%.

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Industry M Orders

The following M order amendments of interest to the electrical industry have been issued by the National Production Authority. Orders not of interest have been omitted. Copies may be secured from the National Production Authority, Washington 25, D. C., or any regional office of the Department of Commerce.

Amendments to Previous Orders

Amendment to M-5 makes this order conform to the newly effective Controlled Materials Plan.

Amendment to M-8 revises regulations governing use of pig **tin** for the third quarter 1951 so that all users are held to the 90% quota limitation; reduces to 6,000 lb the amount of pig **tin** that can be purchased without an allocation; reduces inventory of lead base alloys to 45 days.

Amendment to M-12 removes from this order regulations on the use of **copper** and **copper-base alloys** which have recently been incorporated in other orders.

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Non-Utility Power-Plant Builders Must Tell Depa

Sample forms were made available last week for non-utilities which propose construction of any generating project at this time involving the installation of any item of ac power equipment with a rating of 2,000 kw or larger.

Designated as form DEPA-5A, it calls for specifications and information as to heavy equipment needed, name of manufacturer, purchase order number, and promised shipping date.

The information is to be used by the Defense Electric Power Administration in advising the National Production Authority on scheduling heavy equipment.

Canadian Rationing Plan Hits Non-Ferrous Metals

Canadian rationing of aluminum, copper, and brass came under government control on June 1. Under this compulsory control program, supplies from mills to manufacturers will be on the basis of 100% of 1950 purchases.

However, officials said the Canadian defense effort will get first call on these materials. It appeared likely that within a few months certain nonessential manufacturing requiring these materials would be curtailed.

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Convert to Coal if Iran Oil Production Ceases

Petroleum Administration for Defense will order all East Coast oil-consuming industries (this would include electric utilities) to shift to coal if the Iranian oil supply is cut off. The order has already been drawn for issuance as needed.

Another Interior Department agency, the Defense Solid Fuels Administration, is now making a survey of available coal standbys. Information from the survey will be used to determine the amount of oil which could be diverted to other uses and the amount of coal required should the order be put into effect.

In April, the latest month for which figures are available, utility oil use was as follows: New England, 1,033,161 bbl; Middle Atlantic, 1,100,229; and Southeast, 962,467. Except in the Southeast it would be easy for practically all companies to convert to coal.

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ETD Controlling Pipe

Control over the allocation of fabricated pipe has been assigned to the Engine and Turbine Division of the National Production Authority. This product, used in power plants as well as in installations of the petroleum and chemical industries, is described as "piping fabricated from purchased pipe by bending, swaging, or welding, and not installed by the fabricator."

Changes in Capacity Reported to Federal Power Commission

PLANT ADDITIONS DURING APRIL

State	Utility	Plant	Fuel	Capacity (Kw)
Vt.	Central Vermont Public Service Co	Waybridge	H	2,500
Conn.	Connecticut Light & Power Co	Devon	S	66,000
Ohio	Troy Electric Department	Troy	S	5,000
Ohio	Cleveland Electric Illuminating Co	Lake Shore	S	60,000
Ohio	Lebanon Trustees of Public Affairs	Lebanon	IC	1,265
Mich.	Lansing Board of Water & Electric Light Commissioners	Ottawa Station	S	25,000
Minn.	Rural Cooperative Power Association	Elk River	S	2,300
Minn.	Delano Municipal Power Department	Delano	IC	1,136
Minn.	Blooming Prarie Municipal Light & Power Department	Blooming Prarie	IC	314
Minn.	Northern States Power Co	Mobile Unit 2	IC	1,000
Iowa	Iowa Public Service Co	Kirk Station	S	7,500
Iowa	Cascade Electric Department	Cascade	IC	703
Iowa	Southwestern Federated Power Cooperative	Creston 2	S	15,000
N. D.	Minnkota Power Cooperative, Inc	Plant 3	S	11,500
S. D.	Miller Light & Power Department	Miller	IC	690
Neb.	Broken Bow Municipal Utilities	Broken Bow	IC	1,800
Neb.	Winside Power & Light Department	Winside	IC	148
Kan.	Erie Water & Light Department	Erie	IC	200
Va.	Virginia Electric & Power Co	Chesterfield	IC	200
N. C.	Wilson Utilities Department	Wilson	S	125,000
Fla.	Waechula Municipal Light Department	Waechula	IC	840
Tenn.	U. S. Army Engineers	Center Hill	H	45,000
Ala.	Alabama Power Co	Gorgas No. 2	S	100,000
Tex.	West Texas Utilities Co	Lake Pauline	S	20,000
Tex.	San Antonio Public Service Board	Leon Creek	S	30,000
Colo.	Holyoke Municipal Light Department	Holyoke	IC	800
Colo.	Public Service Co. of Colorado	Arapahoe	S	40,000
Ariz.	Bureau of Reclamation	Davis Dam	H	90,000
Utah	Parowan Electric Department	Parawan	H	600
Wash.	Bureau of Reclamation	Coulee Dam	H	108,000

PLANT RETIREMENTS DURING APRIL

Me.	Maine Public Service Co	Washburn	IC	800
Ohio	Lebanon Electric Light Department	Lebanon	S	400
Ohio	Dayton Power & Light Co	Frank M. Tait	S	20,000
Minn.	Delano Municipal Power Department	Delano	IC	88
Neb.	Pierce Utilities Light & Power Department	Pierce	S	150
Va.	Virginia Electric & Power Co	Alexandria	S	3,000
Va.	Appalachian Electric Power Co	Cranberry Hydro	H	100
W. Va.	Virginia Electric & Power Co	Hillsboro	IC	200
Okla	Tri-County Electric Cooperative	Hooker	IC	160
Tex.	Lower Colorado River Authority	Marble Falls	H	520
Tex.	Central Power & Light Co	Three Rivers	IC	100

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of May 1—Steam 50,863,650 kw; Internal Combustion, 1,932,191 kw; Hydro, 18,103,681 kw; Total, 70,899,622 kw.

Strikes Stop Construction Work at Shawnee, Joppa Steam Plants

Strikes have practically halted construction at Tennessee Valley Authority's Shawnee plant west of Paducah, Ky., and at the Joppa, Ill., plant of Electric Energy, Inc, on the other side of the Ohio River. The plants are being constructed to serve an Atomic Energy Commission plant near Paducah.

Operating engineers walked out at the TVA plant in a jurisdictional dispute Friday, July 6. They contended they had the right to make repairs and alterations on cranes and draglines. The work previously had been done by linemen of the International Brotherhood of Electrical Workers, AFL.

Construction work at the Shawnee plant continued temporarily on a limited scale although the operating engineers were out. Last Tuesday, July 10, when it became apparent that work could not be continued on an economic basis without the services of the engineers, all work was discontinued.

At the Joppa plant, Ebasco Services, Inc, contractors for EEI, were experiencing similar difficulties with their workmen. Hoisting engineers, operating pile drivers, and laborers all claimed the right to unload wooden piling. Carpenters and laborers also disputed the right to take away forms from concrete.

In addition, laborers at the Joppa plant walked out over how much pay they should receive on days they were called out but could not work full time because of rain. Work at Joppa has been practically shut down since July 6.

Plant on Guam to Start Operations This Summer

Guam's largest power plant will begin operation this summer, the Navy has announced.

Powered by steam, the plant will have two generators. Provisions have been made to install another as the need arises. Capacity of the generators is listed as confidential. The plant is part of the $30 million utilities program for the island.

With two diesel plants already in operation, the new plant output will be fed into an integrated distribution system.

Senate Hacks at USBR Construction as Debate Continues on Interior Bill

Senators aimed the sharpest blows of their axes at the multi-million dollar construction program of the U. S. Bureau of Reclamation last week as debate continued on the Interior appropriations bill.

Sen Paul Douglas, Illinois Democrat, attempted to slice $16 million from the bureau's program, which included dams with power features. Sen Homer Ferguson, Michigan Republican, sought to lop $10 million off the bureau fund.

On the first test vote, however, Senators stood behind committee recommendations for restoring $342,000 to Southeastern Power Administration for planning and building transmission lines. This included a Buggs Island-Kinston (N. C.) line and a Clark Hill-Greenwood (S. C.) line.

The Senate appropriations committee recommended that most power items in the bill be restored to levels approved by the House committee.

The Senate group deleted an item of $1,560,600 the House had approved for Southwestern Power Administration.

Other committee action included:

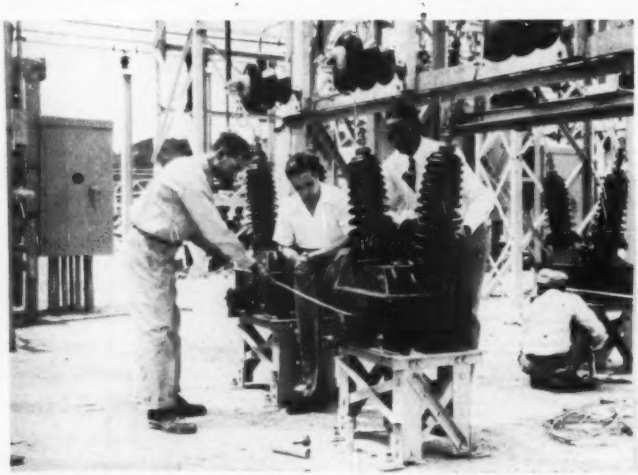
Recommendation that the Denison-Payne transmission line be turned over to SPA.

Elimination of the survey funds for the Lagrande and Baker line, which would have permitted Bonneville Power Administration to move into Idaho.

Elimination of the American Falls Power Division of the Minidoka Project.

Clarification of the House-approved Keating amendment, by restricting Reclamation Bureau construction of transmission lines in areas where private companies are willing and able to wheel power (EW, May 14, p 12).

Approval of House action deleting the Central Valley Oregon tie-line.



PUERTO NUEVO steam station in San Juan, Puerto Rico, has become a laboratory for Latin American technicians studying electricity production. As contribution to Point 4 Program, legislature has appropriated $50,000 for this and similar training. In photo, Miguel Garcia, plant's electrical supervisor, is shown instructing Aristabulo Lampert of Venezuela and Antonio Rimpel of Haiti, both technicians

Yields on Utility Bonds Are Still Rising

Preferred Stock Market Has Dried Up, but Electric Companies Are Having No Difficulty in Selling Common and Debt Securities

Yields on electric utility bonds continued to inch upwards in the second quarter of 1951 following the pattern set at the end of the first quarter when the Federal Reserve Board abandoned its policy of supporting Treasury bonds at par.

Though it is costing them more, utilities are still able to obtain debt money without difficulty. Insurance companies and institutional investors have found the higher bond yields particularly attractive.

One effect of the steady rise in bond yields since last March has been the drying up of the preferred stock market. Only $2 million in preferred stocks were offered by utilities in the second quarter. In the first quarter the figure was $23,660,000.

Consequently there has been an increase in the percentage of debt and common stock new money financing at the expense of preferred. New money financing during the second quarter totaled $329,704,000 (see table). Of this amount 67.2% was secured from the sale of bonds, 0.6% from the sale of preferred, and 32.2% from the sale of common. In the first quarter the percentages were 62.3% for bonds, 6.2% for preferred, and 31.5% for common. For 1950 preferred stock made up 21% of the new money total.

During the first half of 1951 utilities offered $117 million less preferred stock than in the first six months of 1950. In the same period bond offerings were up $91 million over the first half of 1950, and common stock offerings were up $23 million.

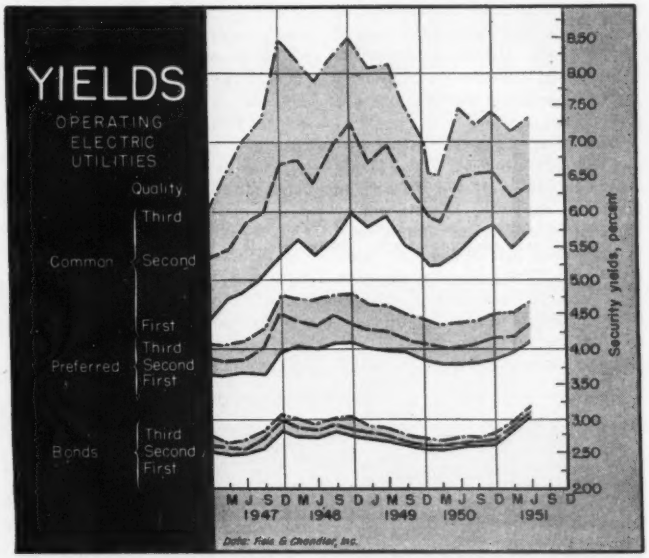
During the second quarter common stock yields rose and prices declined slightly—a reversal of their first quarter status. The common stock market, however, is holding up well, and utilities are still able to dispose of their common offerings.

The Dow-Jones utility price average was down 0.4% in the second quarter but still 2.7% above the average for Dec. 30, 1950. Utility stocks held up better than industrials during the quarter, the latter being off 2.1%.

On new bond issues coming to market utilities have had to pay ¼ to 1% more in interest costs than the level on outstanding issues. The yield on a $25-million bond offering made by Cleveland Electric Illuminating Co June 27 was 3.26%. The yield on similar quality outstanding bonds June 28 was 3.02%. In an offering by Appalachian Electric Co the yield was 3.63% compared with 3.23% on comparable quality outstanding bonds.

During the second quarter yields on outstanding issues of first quality bonds rose .15% from 2.87% to 3.02%, second quality yields .18% from 2.93% to 3.11%, and third quality .23% from 3.00% to 3.23%. Yields on preferred went up .15% on first quality from 3.96% to 4.11%, .18% on second quality from 4.19% to 4.37%, .16% on third quality from 4.52% to 4.68%. Common stock yields also showed an increase in the second quarter as follows: First quality up .26% from 5.47% to 5.73%, second quality .18% from 6.20% to 6.38%, and third quality .21% from 7.16% to 7.37%.

The increases since Dec. 28 on outstanding issues are as follows for first, second, and third quality bonds and preferred stock respectively: Bonds .37%, .44%, .45%; preferred .25%, .23%, .17%. Yields on common stock are still below the Dec. 28, 1950 levels. On first and third quality



Public Offerings
Electric Utility Securities
(Total Estimated in Thousands of Dollars)

	New Money	Other	Total
FIRST QUARTER OF 1951			
Bonds	$238,634	$9,866	$248,500
Preferred Stock	23,660		23,660
Common stock	120,585		120,585
Total	382,879	9,866	392,745
SECOND QUARTER OF 1951			
Bonds	$221,600		221,600
Preferred Stock	2,000		2,000
Common Stock	106,104		106,104
Total	329,704		329,704
FIRST HALF OF 1951			
Bonds	$460,234	$9,866	$470,100
Preferred Stock	25,660		25,660
Common Stock	226,689		226,689
Total	712,583	9,866	722,449

common they are down .07%, and down .16% on second quality.

Dividend increases have been fewer in the second quarter than in the first. Only two utilities increased their dividends during the quarter and one company made a decrease. This compares with six increase and no decreases in the first quarter and 12 increases during the second quarter of 1950. The decline in the number of increases indicates management's growing concern over rising costs and higher taxes.

New money financing for the first half of 1951 totaled $712,583,000 compared with $715,434,000 for the first half of 1950. If new money financing is maintained at this level in the second half of the year, combined with $700 million which arises from depreciation accruals and retained earnings, the industry will come close to financing its proposed $2.5 billion construction program.

Committee on New England Economy Urges Changes in U.S. Power Policy

Changes in government power policy have been recommended to President Truman as a means of putting New England on a more sound economic footing.

The recommendations came in a report of the Committee on the New England Economy, which was appointed by the President's Council of Economic Advisors. Noting the higher costs of electric power in New England, the group urged multi-purpose projects as a possible means of reducing power cost.

It then went on to recommend these departures from present government power policy:

1. Let private companies own and operate the power components of multi-purpose projects.

2. Open the sale of power at the bus bar "to all users on equal terms."

In transmitting the proposals, the President's council said it was giving them careful study "without necessarily endorsing" them.

The report blamed higher power costs "in large part" on the high cost of fuel. Average cost of fuel per kwhr generated is almost 2 mills higher in New England's leading steam-plants than for similar plants elsewhere.

Recognizing that hydroelectric power "is not a panacea" for the higher power costs or for development of the area's economy, the committee said it favored maximum use of water-power resources only to the extent it would produce lower power rates.

Finally, the committee said, "reduction in state and local taxation on utilities in New England would permit some slight decrease in utility rates."

CLEANUP IN KOREA continued as cease-fire talks got underway last week. Here, two Korean linemen are shown repairing poles and lines in streets of Seoul

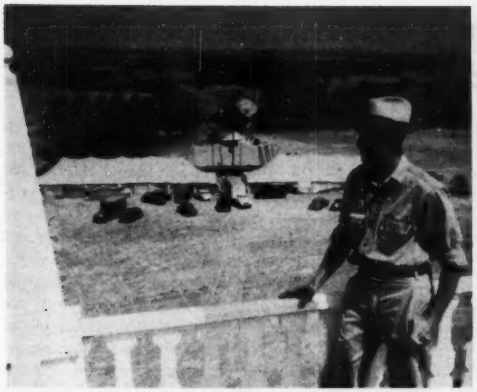
Wisconsin Electric Power Is Badly Hit by Storm

A severe wind and rain storm in Wisconsin last week caused extensive damage to Wisconsin Electric Power Co, Milwaukee. Wires were down, transformers damaged, and transformer fuses blown. The utility termed the storm the worst in the system's history.

Wisconsin Power & Light Co reported light damage and Madison Gas & Electric Co said 10% of its customers were without service during the storm but service was restored in most cases within 24 hours.

In Milwaukee 533 Wisconsin Electric wires were knocked down during the storm, which began early Sunday morning. Two thousand trees came down and branches were stripped off 5,000 more, causing most of the damage. The storm damaged four transformers and 72 transformer fuses were blown. Twenty-nine utility poles were snapped off.

The utility's 150 crew men worked all day Sunday and Sunday night repairing damage. By Sunday night service was restored to most customers.



NEW YORK farm electrification began here in 1901. At right is Corliss Timmerman, whose farm was among first served

YOUNG FARMERETTES at celebration were fascinated by model of electrified farm. Show was staged near St. Johnsville

LT GOV MOORE, Niagara Mohawk's Pres Macheld, Ag College Dean Myers and PSC Chairman Feinberg were chief speakers

BERT KLOCK was 37 when first farm line was built near his home. In 50 years he has seen the area fully electrified

N.Y. Farm Electrification Council Celebrates Indian Fighter's Victory

Fifty years ago a mill owner at Inghams, N. Y., two miles upstream from Guy Beardslee's 180-kw hydro plant on East Canada Creek, decided he could use electric power if Beardslee could get it to him. Beardslee, an old Indian fighter, said he'd do it all right, but when he surveyed the route along the creek, he found the terrain too rough to permit stringing a line. Only thing to do, he decided, was to run the line east to Snell's Bush Road and then north to the mill, a total distance of 4½ miles.

That's where New York's first farm electrification came in. Beardslee was a business man as well as a pioneer. That extra line had to pay for itself; he saw the rich farms along the road was the answer. Beardslee had to battle to convince those farmers kilowatts could lift the loads from their backs. But finally one of them, Charles Cook, agreed to try electric power to run some machinery. Cook himself bought the motor, wires, transformer, meter, and other equipment to be rigged in his barn. He pulled the switch, others came along, and Beardslee became a farm electrification magnate.

New York celebrated Beardslee's victory June 30 with a Golden Jubilee at the site. In tents along Snell's Bush Road near St. Johnsville, the New York Electrification Council set up an exhibition showing farm life before and after electricity was used.

Beardslee started something, the exhibit indicated. Power is now available to almost every farm in New York. A quarter century ago only 25,400 farmsteads in the state were electrified; today 139,000 rural customers are served by 52,000 miles of line. Since 1937, average annual use has climbed from 1,000 to 3,500 kwhr and average cost for farm service has dropped from 5½ to 2 3/10 cents per kwhr.

It poured the day of the celebration, but 3,000 persons turned out anyway. In a large tent set up as an auditorium

they heard predictions of bigger things in farm electrification. Judging from the speakers, the state felt the event an important one. Among them were Lt Gov Frank Moore; Benjamin Feinberg, chairman of the state Public Service Commission; Dr. William I. Myers, dean of New York State College of Agriculture; and Earle J. Machold, president of Niagara Mohawk Power Corp.

The Council, founded in 1925, consists of representatives from the College of Agriculture, Public Service Commission, farm organizations, and electric utilities supplying the state.

Pacific Southwest Margin, Safe Now, Predicted to Be at Minimum in 1952

Margins on power production in the Pacific Southwest power area (Arizona, California, and Nevada) appear to be fairly safe if 1951 is a good water year. This opinion was expressed by Harold P. Huls, chairman of California's Public Utilities Commission, following a fact-finding hearing in Los Angeles July 6.

H. A. Lott, vice chairman of the Pacific Southwest Power Interchange Committee, told the commission reserve margins will be at a minimum in 1952. The nominal margin of 1,277,000 kw (18%), is not dependable, he said, because it makes no allowance for maintenance or breakdown, spinning or contingency reserve, or generating capacity required for dry-year reserve. However, he added, by pooling all resources in the area and by efficient use of interconnections the demands can be supplied —provided scheduled additions to generating capacity and interconnections are installed as planned.

Major factors in such a pooling operation will be two interconnection increases: Increase of the Southern California Edison-Pacific Gas & Electric tie to 300 mw by March, 1952, and increase of the Southern California Edison-Los Angeles Department of Water & Power tie to 230 mw by September of that year. Loads and resources of the various agencies within each area and between areas will be integrated only to the extent necessary to cover deficits when indicated.

Maximum area peak demand in 1954 was estimated at 8¼ million kw, an increase of 44% above the 1950 peak. Energy demands were estimated at 45.5 billion kwhr, up 45% over 1950. To meet these demands, 3,302,000 kw capacity will be added between 1951 and 1954.

150 Employees Finish Cleveland Utility Course

The first 150 persons to complete courses in the Advanced Education Program sponsored by Cleveland Electric Illuminating Co were graduated in a ceremony in company offices June 27.

The two courses, begun in January, 1949, cover a study of company departments and their functions, and specialized training in conference leadership, report writing, engineering economy, public speaking, and economics of the industry.

Subjects offered were designed to help employees better understand the electric company's policies and operations.

Company executives serve as lecturers in the company operations course. Instructors in the specialized management course include company personnel and faculty members from Western Reserve University and Case Institute of Technology.

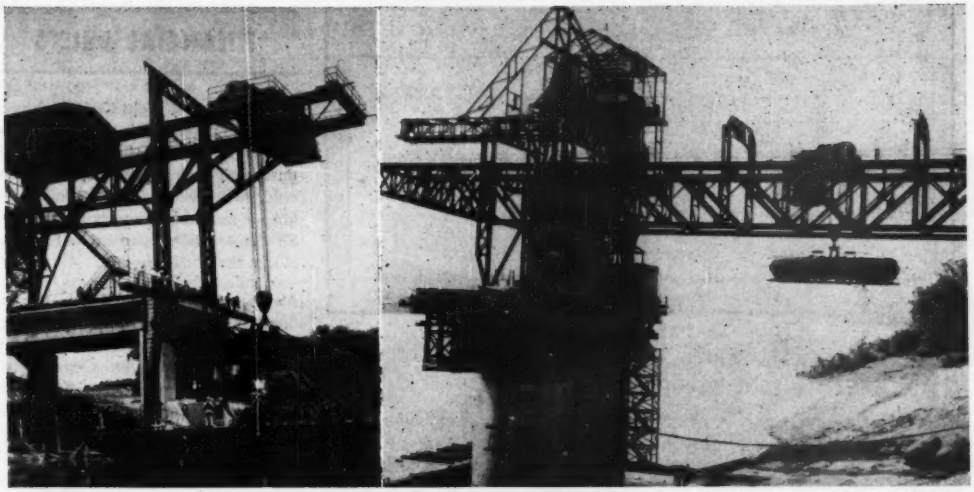
Of the 150 graduates, 126 hold college degrees and 98 are members of CEI's management group. At present, 217 employees are enrolled in the program.

GRADUATION was held June 27 for 150 Cleveland Electric Illuminating Co employees who completed company's Advanced Educational Program. Here Pres Elmer L. Lindseth (left), congratulates graduate Gustav A. Schoch, superintendent of substations. In center is Joseph P. Fleming, supervisor of the training program

Dayton P&L Investigating Blast at Hutchings Plant

Officials of Dayton Power & Light Co are investigating the cause of an explosion July 4 at the company's O. H. Hutchings Plant which killed one man and critically injured another.

An accumulation of coal gas in the conveyor room of the No. 1 bunker exploded at 7:37 A. M. What set it off has not yet been determined, a spokesman for the company said last week. Two sections of a tile partition in the room were blown out, but total damage to the plant was minor. The conveyor was not running at the time. No outage occurred.



TWO POWERFUL CRANES are being used to help build Cincinnati Gas & Electric Co's Clermont Power Station near New Richmond, Ohio, on the Ohio River. At Miami Fort Plant 40 miles downstream, crane at left loads steam boiler on company barge. Barge is then towed upriver to the new site and boiler lifted off by crane at right for installation in the steam plant

Most Powerful Inland River Cranes Put to Work to Build Ohio Plant

The two most powerful cranes operating on America's inland rivers have been put in service by Cincinnati Gas & Electric Co to build its Clermont Power Station on the Ohio River near New Richmond.

Each crane has a rated capacity of 187½ tons, but each has been approved for loads up to 207 tons. One is at the company's Miami Fort Power Station, 20 miles downstream from Cincinnati, the other at the Clermont site, 20 miles upriver from the Ohio city.

Clermont is one of the few large generating plants not served by a railroad. The company had the choice of building a railroad spur at a cost of $3 to $5 million to haul heavy equipment to the plant or building the two river cranes at a total cost of $750,000. It chose the cranes.

Heavy pieces for Clermont Unit No. 1 are brought by rail to Miami Fort Station, transferred to a barge by the first crane, and towed upriver to the new plant. There the second crane lifts them off and moves them over yard rails to a point where cranes inside the plant can handle them. Pieces being moved in this way include the 90-ton boiler steam drum, the 100-ton rotor, and the 200-ton stator.

While Clermont No. 1 is under construction, contracts have been made for units 2 and 3. First two will have capacities of 100,000 kw and the third, 125,000.

Total cost of the plant, including three units, will be about $80 million, the utility reports. Unit No. 1 is expected to begin operating March 1, 1952.

After all units are installed, the large cranes will be used to maintain and replace the heavy equipment.

•

Ohio Plant Back on Line after June 22 Oil Fire

Picway Plant of Columbus & Southern Ohio Electric Co is back in service after a fire on June 22. Repairs to the building at Lockbourne will not be completed for several months.

Just before the fire, a thermometer well came out of the outboard bearing of a turbine. The oil under pressure poured out on the floor. It is believed that in some way the oil came in contact with the throttle and ignited. The fire lasted nearly two hours. The control room was destroyed. Part of the roof fell in.

Three of the four 30,000 kw units were damaged by the fire. They went back on the line on June 28, June 30, and July 8. The fourth unit was not in use at the time of the fire. Temporary control boards have been installed, and a temporary roof has been erected inside the building.

Loss of the station which has about 37.5% of the company's capacity was made up by increasing the output of the company's three other plants. A 138-kv interconnection was made with Ohio Power Co. This has been supplying 50,000 kw.

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Key West Buys Plant Site

The City of Key West has purchased a $35,000 site on Trumbo Island for a new plant to be built by the city electric system.

INDEX AVAILABLE

Copies of the Index to Electrical World for January through June, 1951, are now available. Address requests: Electrical World, Editorial Department, 330 W 42 St, New York 18, N. Y.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1951									
July 5	3.00	3.07	3.21	4.13	4.32	4.66	5.69	6.33	7.27
June 28	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
END OF QTR.									
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25

Data: Reis & Chandler, Inc.

Sales of Energy in March, April Exceed 1950 Levels

Sales of electrical energy in March and April continued to run ahead of those for the corresponding months last year. March sales were 15.2% ahead of those for March, 1950, and April sales were 15.8% higher than those for the same month last year.

In March electric utilities sold 26,000,593,000 kwhr to ultimate customers compared with 22,564,518,000 kwhr in March, 1950. Revenue from ultimate customers for the month was $460,900,400, a gain of 11.3% over the $414,263,200 received a year ago.

Classification of Sales

Kilowatt hour Sales	Million Kwhr 1951	Per 1950	Cent Change
March			
Residential or domestic	6,593	5,782	+14.0
Rural (distinct rural rates)	546	493	+10.7
Commercial or Industrial			
Small light and power	4,565	4,002	+14.1
Large light and power	12,772	10,830	+17.9
Street and Highway Lighting	279	250	+11.7
Other Public Authorities	654	596	+9.8
Railways and Railroads			
Street and interurban railways	320	324	—1.5
Electrified steam railroads	222	231	—3.9
Interdepartmental	50	57	—12.0
Total to ultimate customers	26,001	22,565	+15.2
April			
Residential or domestic	6,339	5,521	+14.8
Rural (distinct rural rates)	724	605	+19.7
Commercial or Industrial			
Small light and power	4,556	3,986	+14.3
Large light and power	12,868	10,930	+17.7
Street and Highway Lighting	254	221	+14.7
Other Public Authorities	656	581	+12.9
Railways and Railroads			
Street and interurban railways	287	288	—0.2
Electrified steam railroads	210	209	+0.6
Interdepartmental	47	55	—15.7
Total to ultimate customers	25,940	22,397	+15.8

Average usage per residential or domestic customer increased 8.8% in the twelve months ended March 31 to 1,879 kwhr. The average annual bill was up 6.2% to $53.74 but revenue per kilowatthour declined 2.4% from 2.93¢ to 2.86¢.

Utilities sold 25,940,310,000 kwhr in April. The figure for April, 1950, was 22,396,907,000. Revenue for the month totaled $456,778,900, or 11.4% more than the $410,075,600 received for the corresponding month a year ago.

Average usage also increased 8.8% for the twelve months ended April 30. The figure for the twelve-month period was 1,893 kwhr compared with 1,740 kwhr for the previous twelve months. The average annual bill for the same period increased 6.2%, climbing to $53.95. Revenue per kilowatthour was down 2.4% falling from 2.92¢ to 2.85¢.

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National P&L Stock Sale Is Approved by the SEC

Electric Bond & Share Co has received approval from the Securities and Exchange Commission to sell its entire stock interest in National Power & Light Co to Phoenix Industries Corp.

Phoenix will purchase Electric Bond & Share's holdings of 2,540,450 shares or 46.5% of National P&L's common stock at a price of 45¢ a share. Phoenix will offer to buy shares held by other National stockholders at a similar price. This offer will be open for 30 days.

SEC has modified a 1941 order directing the dissolution of National since the company no longer has any interest in public utility companies and the purchasers of its stock have pledged themselves not to invest in public utility companies in the future.

At the time of the 1941 order National had nine public utility subsidiaries.

FINANCIAL BRIEFS

Pacific Power & Light Co has received permission from Federal Power Commission to issue $16.1 million in 3½% unsecured promissory notes. The proceeds will be used by the utility to finance cash requirements of its 1951-52 construction program, which includes the Yale Project.

An increase in rates of the Shenandoah Valley Electric Co-operative, Dayton, Va., has been authorized by the State Corporation Commission. The rate boost goes into effect with bills rendered after July 21. Rates for consumption over 200 kwhr a month for farm and home service without controlled water heating will go up from 1.25¢ to 1.5¢ per kwhr. Controlled water heating service rates were raised from 1¢ to 1.3¢. Commercial and small power customers using more than 200 kwhr per month will have to pay increases of varying amounts but not more than a half a cent per kwhr.

Ohio Power Co and its subsidiary, Union City Electric Co, Union City, Ohio, have applied for Securities and Exchange Commission permission to dissolve Union Electric and transfer its properties to Ohio Power.

Effective date of a lighting rate adjustment has been postponed for one year by the Tacoma, Wash., city council. Affecting mainly those who use electrical equipment for heating, the new rate provided that the lowest monthly bill would have to be at least 65% of the highest winter bill. Under the amended measure, the minimum rate will be determined by the maximum rate between October, 1951, and April, 1952. The postponement will permit further study of the rate structure and allow those using electric heating to convert to another type of heating.

Pacific Gas & Electric Co's 1950 tax bill increased 36% to an all-time high of $54,703,068. Higher taxes and the addition of new properties to local assessment rolls contributed to this increase. The utility paid local property taxes totaling $25,764,353. Other local taxes and federal and state income taxes amounted to $28,938,715.

March Production, Use Set Records in Canada

Canadian central stations in March set a production record approaching the 5 billion kwhr mark. The total was 4,911,861,000, compared with 4,185,643,000 for the same month the previous year.

Consumption of primary power also hit a new peak of 4,396,480,000 kwhr, more than half a billion higher than in March, 1950.

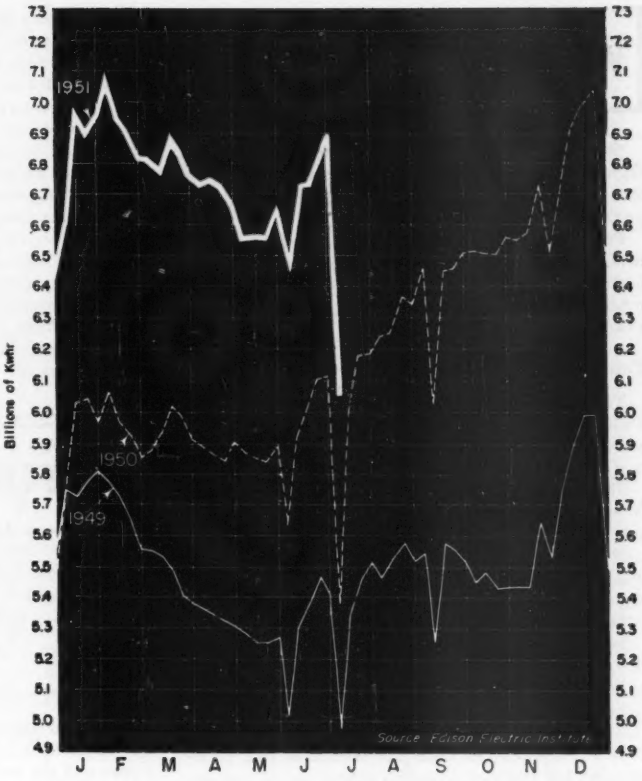
In April, both production and consumption dropped back somewhat, as did exports to this country. The three figures were 4,895,491,000 kwhr, 4,227,187,000 kwhr, and 208,203,000 kwhr, respectively.

The following statistics, in thousands of kwhr, were supplied by the Dominion Bureau of Statistics:

Period	1951	1950
March Output	4,911,861	4,185,643
Primary	4,536,322	3,939,778
Secondary	375,539	245,865
Primary Consumption	4,396,480	3,800,633
Net Exports to U. S.	220,750	175,733
April Output	4,895,491	4,070,021
Primary	4,356,259	3,789,167
Secondary	539,232	280,854
Primary Consumption	4,227,187	3,655,915
Net Exports to U. S.	208,094	190,595

Gets 30-Year Franchise

Odum, Ga., has granted Georgia Power Co a 30-year franchise to supply power to the town.



Output Week Ended July 7—6,077,077,000 Kwhr

Weekly Output, Millions Kwhr			Percent Change from Previous Year			
1951	1950	1949		July 7	June 30	June 23
July 7 6,077	July 8 5,380	July 9 4,982	New England	+10.7	+ 9.4	+10.4
June 30 6,898	July 1 6,115	July 2 5,410	Mid-Atlantic	+12.3	+12.6	+11.2
June 23 6,835	June 24 6,102	June 25 5,466	Central Industrial	+12.9	+11.5	+10.3
June 16 6,747	June 17 6,012	June 18 5,373	West Central	+12.0	+ 9.8	+ 9.3
June 9 6,734	June 10 5,921	June 11 5,300	Southeast	+10.1	+13.2	+11.5
June 2 6,445	June 3 5,632	June 4 5,018	South Central	+22.5	+19.0	+16.6
May 26 6,653	May 27 5,894	May 28 5,270	Rocky Mountain	+15.1	+12.5	+14.9
May 19 6,559	May 20 5,845	May 21 5,255	Pacific Coast	+12.3	+13.9	+14.9
May 12 6,567	May 13 5,864	May 14 5,527				
May 5 6,560	May 6 5,868	May 7 5,284	Total United States	+13.0	+12.8	+12.0

MEETINGS

American Institute of Electrical Engineers
Pacific General Meeting, Multnomah Hotel, Portland, Ore., August 20-23; Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

Pacific Electronic Exhibit
Civic Auditorium, San Francisco, August 22-24.

Illuminating Engineering Society
National Technical Conference, Hotel Shoreham, Washington, D. C., August 27-30.

Northern California Electrical Bureau
Annual Exposition, Civic Auditorium, San Francisco, September 1-9.

Rocky Mountain Electrical League
Fall Convention, La Fonda Hotel, Santa Fe, N. M., September 9-12.

★**Instrument Society of America**
National Instrument Conference-Exhibit, Sam Houston Coliseum, Houston, Tex., September 10-14.

International Association of Electrical Inspectors
Southwestern Section, Hotel Lafayette, Long Beach, Calif., September 13-15; Northwestern Section, Hotel Davenport, Spokane, Wash., September 19-21; Western Section, Hotel Fontenelle, Omaha, Neb., September 25-27; Eastern Section, Chalfonte-Haddon Hall, Atlantic City, N. J., October 1-3.

★**National Electrical Contractors Association**
Annual Convention, Shoreham Hotel, Washington, D. C., October 9-12.

Pennsylvania Electric Association
Annual Meeting, Benjamin Franklin Hotel, Philadelphia, September 18-19; Joint Relay-Communications Committee Meeting, Emerson Hotel, Baltimore, Md., October 18-19.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, September 20-21.

Wisconsin Utilities Association
Accounting Section, Plankington Hotel, Milwaukee, Wis., September 20-21.

Public Utilities Association of the Virginias
Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., September 21-22.

American Society of Mechanical Engineers
Fall Meeting, Hotel Radisson, Minneapolis, Minn., September 25-28.

Iowa Utilities Association
Management Conference, Fort Des Moines Hotel, Des Moines, Iowa, October 1-2.

Southeastern Electric Exchange
Engineering-Operation Section Conference, John Marshall Hotel, Richmond, Va., October 4-5; Sales Conference, Roosevelt Hotel, New Orleans, La., October 31, November 1-2.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, October 9-10.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 10-12.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, October 10-13.

National Association of Railroad and Utilities Commissioners
Francis Marion Hotel, Charleston, S. C., October 16-19.

National Electronics Conference
Annual Conference Edgewater Beach Hotel, Chicago, October 22-24.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

★Addition this week.

WASHINGTON COMMENT

JESSE MOCK

One question the Supreme Court may soon have to decide is, "Does the price of admission entitle you to see the whole show or must you buy another ticket after you're in the big tent?"

Pitched on the plane at which the court will have to decide, the question is, "Does a Federal Power Commission license mean full government approval of an electric transmission line or gas pipe line or can the Interior Department exact an additional toll should the line cross public lands?"

Courts Favor "One Admission" Idea

Two recent federal court decisions have leaned slightly toward the "one admission" idea. But one court opinion was on a side issue which tended to leave the "two admission" idea intact as applied to pipelines.

The two cases—Idaho Power Co vs Federal Power Commission and El Paso Natural Gas vs Interior Department—have a number of parallel circumstances. Both concern right-of-way across public lands. The Interior Department sought to impose the "common carrier" idea to lines crossing public property. The private companies sought to maintain exclusive use of them.

So far the courts have favored the private companies. However, government lawyers are considering appealing in hopes of obtaining reversals and clarifications of the earlier opinions.

In the Idaho Power case, the company asked a Circuit Court of Appeals to set aside provisions in an FPC license requiring the company to permit federal use of company lines crossing federal property.

Finding in favor of the company, the court said, "Congress has ample power, as we have said, to prescribe the conditions upon which the water power potentialities of public lands shall be developed. Its only declaration upon the interconnection of government and private facilities is the one . . . which precludes the interconnection."

The court thus ordered FPC to strike from the license the section requiring the company to permit government use of its line. Previously, another appeals court had found that FPC, rather than Interior, had jurisdiction over power lines crossing federal property—thus giving a boost to the "one admission" idea.

Pipeline Case Decided on Technicality

In the other case, El Paso Natural sought a mandatory injunction from a district court to compel Interior to permit it to build a pipeline across government property. Again the decision favored the company, but the injunction was granted on a technical point. The basic issue—the scope of Interior authority over federal lands—was not clarified. Interior has already announced its decision to appeal this case.

The department based its pipeline case on the Mineral Leasing Act. Section 28 of this act sets forth the "common carrier" provision for conveyances crossing public lands. In carrying out the provision, Interior Sec Oscar L. Chapman asked the company not only to accept the general "common carrier" statement, but he also spelled out the conditions which would have to be met by the company. These included permitting other companies to use the pipeline for transporting gas across public lands and to the destination of the line. These terms quickly spurred El Paso to take its case to court.

While the companies are now on top because of victories in the lower courts, there is still the chance of reversal by the higher courts.

Reversal would mean the "two admission" idea. Because of the thoroughness with which the FPC acts in making license study and because the commission is thoroughly conversant with all phases of a project before the license is issued, it would seem this is the appropriate agency to handle the government stamp of approval for electric and gas development.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Iron heated above 1670 F changes its crystalline form from a body-centered to a face-centered cubic arrangement of atoms; alloying shifts the temperature.

Climbers with double-gaffs might save a linesman occasionally from injuries incurred as a result of "cut-out" due to a knot, nail-head, or false move.

Network fuse inspection revealed an appreciable percentage disclosing signs of break in the bond between the copper and the fusible alloy; replacement minimized the prospect of cascading.

Wind generators with 6-ft blades and a 25 mph wind atop a London hotel will generate 20 amp at 12 v for emergency lighting and battery charging in curtailment periods.

Cooling water for a Texas utility plant is obtained from a lake purposely made large enough to serve also as a water supply for the nearby city.

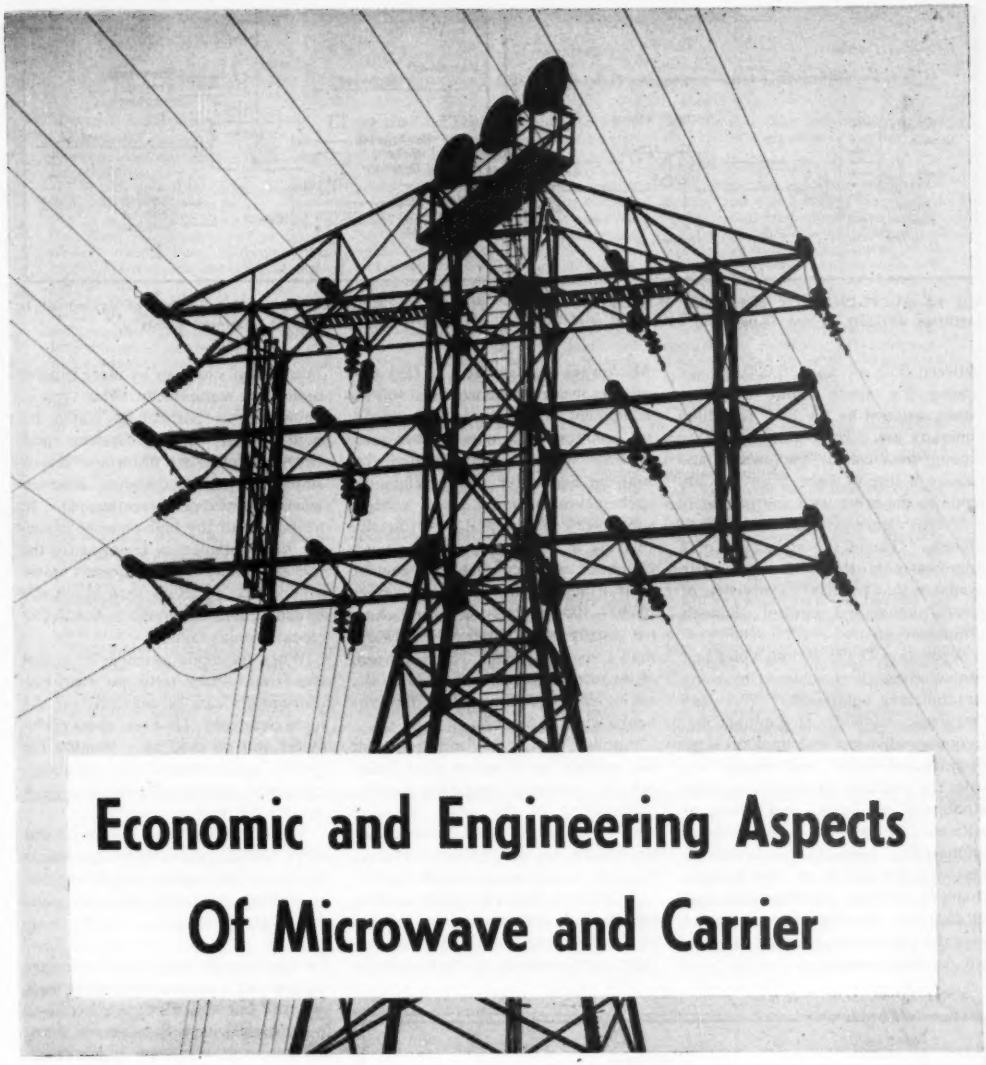
Retractible soot blower operation can be impeded if growth of castiron blocks at boiler wall entrance occurs and is not corrected by boring.

Control conductor lengths amount to approximately 15 miles for each mile of piping in the boilers (222 and 15 respectively) in a recent station.

Corrosion of iron is retarded by treatment with "Caphos," an acid phosphate that coats the surface with a metal-like film that renders the iron passive.

Dispersion of a *ton* per hour of gases from a 400-ft stack will ordinarily result in no greater concentration at ground level than one *pound* per hour from a 10-ft stack.

Superconductivity (zero resistance at zero absolute) now appears to be more attributable to nuclear phenomena than to altered electronic configuration outside the nucleus. How about studying copper as well as mercury? Zero resistance sounds intriguing.



Economic and Engineering Aspects Of Microwave and Carrier

F. C. KRINGS
Central Station Engineering Division, General Electric Co

More channels are afforded by microwave. They are independent of transmission circuit but repeaters may be necessary for long distances and independent standby power supply is indicated. Channels to scattered points are best provided by carrier, as well as protective relaying and other vital operating services

Interest in microwave communication for the electric utilities springs from the availability of microwave frequencies and microwave equipment for use in operating and dispatching channels. However, this new tool should be properly evaluated so that it may find its proper place. It has many of the attractive features that have made carrier so valuable.

Frequency bands in the range

Paper largely based on a paper presented by the author at the recent Mid-West Power Conference.

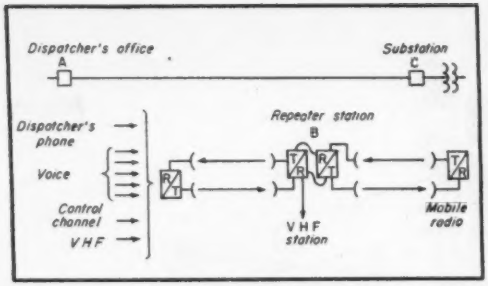


FIG 1—MULTI-CHANNEL installation of microwave affords facilities difficult, if not impossible, to obtain with carrier

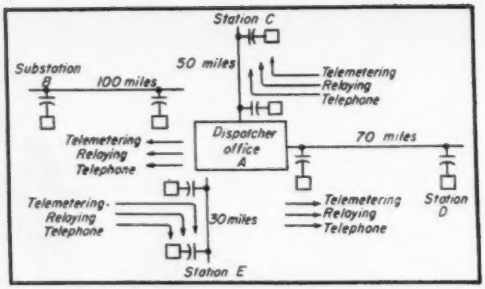


FIG 2—CARRIER requires a lesser amount of equipment to serve party line channels at scattered points

between 950 mc and 30,000 mc are among the space radio frequency bands assigned by the FCC for utility company use. These frequencies are among those called "microwave" and require a line of sight from one antenna to the other with approximately a 50-foot clearance above intervening objects. One of the attractions of a microwave is the wide bandwidth available that permits transmission of several voice and control channels simultaneously.

Separation of the various voice and control channels is achieved by using "multiplexing equipment." There are two basic methods of multiplexing; frequency division and time division. Frequency-division multiplexing divides the available bandwidth by using modulated oscillators and filters at different frequencies. Time-division multiplexing consists of successively sampling the signals of several input channels at a high repetition rate, and successively sending these samples over the microwave, utilizing full output for each sample.

Microwave Equipment . . . One type of microwave equipment is a 960 mc equipment that provides an economical solution to a one- or two-voice channel system. Also, multiplexing may be added for control functions such as telemetering, load control, supervisory control, and line-protective relaying in addition to the two voice channels. A voice channel is capable of transmitting the audio frequencies of 300–3000 cycles. A control channel usually has a narrower bandwidth than a voice channel. The bandwidth of a control channel is dictated by the keying speed requirement of the particular control function.

Another type of 960 mc equipment can provide up to seven voice channels by utilizing frequency-division multiplexing of the single sideband type. Any of the voice channels can be broken up into several control channels by using audio-tone units.

A 24-voice channel system utilizing time-division multiplexing is available in the 2000 mc band. Any one of these voice channels can be broken up into control channels by using suitable audio-tone equipment. This type of equipment is particularly suited for high-channel capacity systems and, because of the low distortion, is well suited for long distance channels where many repeats are needed. In keeping with the high-channel capacity, this equipment is arranged for the use of standby radio frequency transmitters and receivers with automatic switching and automatic indication of repeater point failure.

When parabolic antennas of sufficient front-to-back ratio are used, two transmitters can be operated on the same frequency. Thus one spare transmitter can be used as a standby for the two active transmitters. Similarly, one spare receiver can be used as a standby for the two receivers.

The equipment just described, and other similar microwave equipment which are available, appear capable of meeting practically all power system requirements.

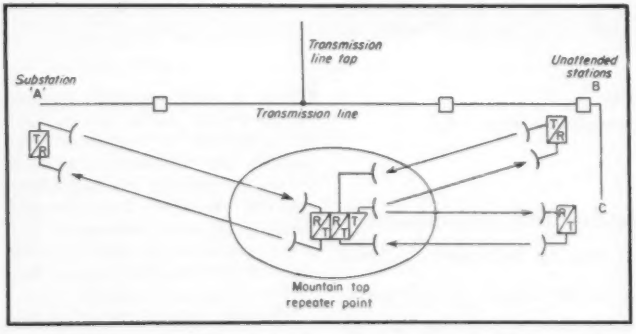


FIG 3—REPEATER STATION may be necessary for microwave but, conversely, bypassing and trapping on the transmission line may be necessary for carrier

Carrier Current Equipment . . . Carrier current equipment is widely used and well known. Since it is confined to the high-voltage transmission lines, application problems are largely those of coupling, trapping and the attenuation of the transmission lines. In general, carrier provides all types of operating and dispatching communication, and usually the individual services operate independently.

A utility wants to achieve reliable telephone service for its dispatching; dependable supervisory control over its unattended substations; accurate and dependable telemetering and load control of the power flow over its tie lines; and the high-speed selective relaying obtainable by using a pilot form of relaying. The reliability of these

These Are the Relative Merits and Demerits of Microwave and Carrier

Microwave Advantages

Inherently, microwave has many characteristics that make it attractive for utility use.

1. It can provide a large number of channels between two points.

2. It is generally considered to be free from man-made static or atmospheric disturbances, although the higher frequencies are attenuated by rain or fog.

3. It can be directed into narrow beams by suitable antennas, thereby reducing the possibility of interference between other nearby microwave and high-frequency channels. This fact, plus the line-of-sight characteristic, will permit the frequent repeating of frequencies providing a large number of channels.

4. Microwave is physically separated from the power transmission circuit.

Microwave Disadvantages

1. Putting a large number of channels on one microwave link is also a disadvantage, for then if the microwave channel becomes inoperative, all of these channels are out of service. However, the use of standby equipment, automatically switched in event of failure, serves to alleviate this disadvantage.

2. Repeater stations are usually necessary for the longer channels, since the usual microwave link is limited to 20-50 miles. These repeater stations represent a hazard to reliability because of the greater number of units required. They also increase the outage time for planned maintenance because there are more units to service at remote locations.

3. The power supply and the emergency power supply for microwave is a problem which has not always been given the full consideration it deserves. At present, all microwave equipment operates from an a-c source. For voice and telemetering this is perhaps acceptable, but when a large number of channels are tied up in a microwave channel, it makes good sense to provide a standby power supply. For protective relaying, or other important services that cannot tolerate a momentary outage, operation from system a-c source is not acceptable and a power supply such as a rotating machine operating from the station battery must be provided. At repeat points, it may be necessary to secure the normal power supply from sources that cannot be depended upon. It is here that the standby power supply becomes more of a problem. The standby equipment should be infallible because at the very time it is called upon for service the channel is usually most urgently needed.

4. Maintenance costs of a microwave channel are rather difficult to predict because there has been very little actual operating experience by utilities. The complex circuitry and the number of tubes involved, however, are some indication of the amount of probable maintenance required. Tube replacement alone may be a costly item even though it can be done on a scheduled basis so that time and transportation are kept to a reasonable amount.

Carrier Advantages

1. Carrier for relaying, supervisory control and telemetering is available for operation from the station battery.

2. Carrier channels are distinct and separate so that maintenance or inoperation usually involves only one channel. The outage of one channel at a time can be tolerated on most utility systems.

3. A carrier channel usually does not involve repeaters, all equipment being installed in or at power plants or substations.

Carrier Disadvantages

1. In some areas carrier has already been so extensively applied that users fear congestion difficulties in adding further channels.

2. The formation of sleet on a power transmission line increases the carrier frequency attenuation, thereby reducing the signal-to-noise ratio. However, modern application practice takes this element into consideration and minimizes the disadvantage.

3. The application of carrier to transmission lines with a cable section is sometimes difficult because of the high attenuation encountered in the cable and in the reflection loss due to the impedance mismatch at the junction of the cable and line.

4. Changes in the configuration of the transmission system may require changes in the carrier-current channels.

services is of great importance. The services should be operable under all weather conditions. Terminal equipment and power supplies for the equipment should be immune to failure. Maintenance requirements should be such as to require only short outage time on a planned basis.

These objectives are of paramount importance in setting up the communication channels; but, of course, these objectives can only be realized to a degree that is consistent with good engineering economics.

Relative merits of microwave and carrier are set up in juxtaposition in the accompanying panels.

Economic Factors . . . Since microwave and carrier are both capable of supplying the channels for the operating and dispatching communication needs of an electric utility company, the choice is largely determined by economics and reliability. In many cases, the reliability requirement will become the dominant factor.

The relative newness of the microwave form of communication, and the unknown variables, such as rate of obsolescence, maintenance expense, etc, make an economic comparison very difficult. However, a few general comments can be made.

Microwave requires a certain amount of equipment for the channel itself, without regard to the multiplex-

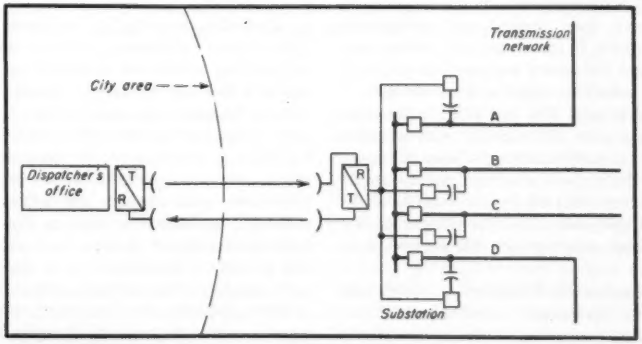


FIG 4—MICROWAVE retransmission into dispatcher's office of communication brought by carrier to outlying substation combines features of both systems

ing equipment. For instance, the channel equipment usually consists of transmitters and receivers, towers and tower sites, antennas and power supplies. The equipment in the foregoing list is necessary whether there is one, or several, voice and control channels. The addition of control, or voice channels to the base channel equipment adds only the multiplexing equipment for these channels. The costs in a microwave channel are similar to the costs in supplying electric power to a street in a residential section of a city. The largest cost lies in the distribution transformer, the poles, the line and the installation of this equipment, while the additional cost of adding on a new house is merely the cost of the service drop.

Microwave Costs . . . Microwave costs, in the general case, are quite dependent upon the length of the channel. The line-of-sight propagation usually limits the distance between antennas to 20–50 miles, depending, of course, on the topography of the land. Thus on channels too long for one hop or where the direct line-of-sight path is obstructed, a repeater station is necessary. One repeater station multiplies the base channel equipment by two, except only one tower is necessary. As pointed out earlier, a repeater station usually requires an emergency power supply, and an enclosure for the equipment.

The equipment needed for a carrier channel is a relatively constant amount per channel, and additional channels usually cannot be added without adding coupling, tuning and possible trapping equipment. One exception to this, is the narrow-band crystal-controlled equipment for supervisory control, load control and telemetering which, in effect, uses one carrier channel for several narrow-band channels.

Another fact that is true in the general case: The cost of a carrier channel does not increase with distance; that is, repeaters are seldom necessary. The costs of a carrier channel are directly affected by the voltage of the transmission line, the number of line traps and bypasses that are necessary.

Application Examples . . . These general statements lead to the conclusion that microwave tends to be suitable for a large number of channels between terminal points; in other words, multichannel installations. An illustration will help to make this clear. Referring to Fig 1, in this hypothetical case there is a dispatcher at A and a substation at C. It is desired to have the following communication channels between A and C; dispatcher's phone, relaying, telemetering, supervisory control, five-voice channels, a channel for VHF mobile radio with an intermediate VHF station. It is at once obvious that this would be technically difficult, if not impossible, by carrier and certainly not economical. Microwave could provide such a channel and would probably prove to be the economic solution.

It is also concluded that carrier tends to be more suitable for party line channels to scattered points. As an illustration (see Fig. 2). a system with a central dispatching point at A and outlying substations or generating plants at B, C, D, E, and it is desired to have telemetering, relaying, and a party line voice channel to the outlying plants as a maximum. In this example, microwave would require a transmitter and receiver and other associated equipment at each of the outlying stations, at least a receiver and possibly a transmitter at A for each channel to the outlying stations. In this application, carrier would require a minimum amount of equipment and would probably be more economical.

Repeater Station . . . The fact that a repeat point is necessary may become the deciding factor. For example (in Fig 3) A is the dispatching point, B and C are small unattended stations. Supervisory control, load control and telemetering are desired between the outlying stations and A, plus pilot relaying. Carrier channels to these locations involved several bypasses around circuit breakers and the trapping of a tapped line, while a microwave channel could get to these stations by using only one repeater. This application appeared to be an excellent one for microwave, economically and technically, especially since the transmission line did not present a clean carrier circuit. However, the only location that would have a line of sight to both unattended stations and to A was at D, a remote location on top of a mountain. A location such as this, involved the expense of building roads and power lines, and providing an emergency power supply. The microwave application was discarded because of the additional costs and hazards that the repeater station introduced, and carrier was selected.

Another application example is the retransmission of channels from the transmission system into a remote dispatcher's office. Fig. 4 illustrates this application. The dispatcher's office is located in a downtown city area and is not near the transmission lines. Carrier current channels on the transmission lines carrying telephone, supervisory control, telemetering, load control are connected to a microwave channel and transmitted to the dispatcher's office.

In the usual case, line protective pilot-relaying is a carrier channel application because of the power supply problem, and also because the microwave terminals usually do not coincide with the transmission line terminals.

These application examples show that there is a definite place for microwave and a definite place for carrier and that they will supplement each other. It is also apparent that nearly all applications will have to be individually examined to find the correct answer, and until the microwave "unknowns" can be judged by actual operating experience it seems to make good sense to use microwave only where it has a large economic or other advantage.

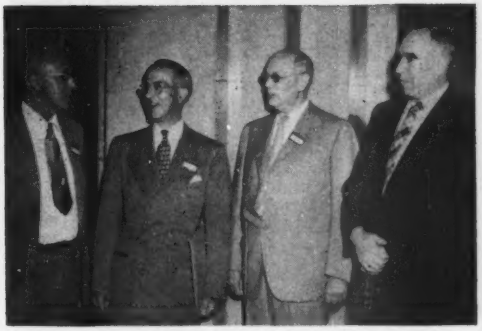
Microwave Beam Clearance

Microwave propogation tests have indicated the importance of obtaining a clear line-of-sight transmission path with ample clearance over obstructions.

In a conference paper presented by F. M. Rives, General Electric Co at the AIEE Summer General Meeting in Toronto, June 25-29 it was stated that a grazing path or obstructions can cause considerable transmission loss. In general, it is essential to have a minimum obstruction clearance of 50 ft. A clearance of 100 ft, minimum is preferable where possible.

Assuming a level terrain, and taking into account the earth's curvature, if 100 ft towers support the antennas the maximum distance that can be covered and maintain a 50 ft clearance is 17.4 miles. A 200 ft tower permits 30 mile coverage and 300 ft towers, 39 miles

AIEE President Fred O. McMillan, Oregon State College; W. R. Harmer, General Meeting Committee; Adele White, columnist, Toronto Globe and Mail; and past president T. G. LeClair



I. W. Gross, American Gas & Electric Service Corp; J. H. Foote, Commonwealth Services; Charles F. Wagner, Westinghouse Electric Corp; and J. E. Clem, General Electric Co, Schenectady

Outages, Apparatus Ratings, Microwaves Are Topics at AIEE Toronto Sessions

Generator tape migration, arrestor application guide, emergency loading of FO-FA transformers, dry-type insulations, underground distribution for housing also canvassed at Summer General Meeting in Canada.

Diversity in papers and discussion ranged from carrier and lightning arresters to transmission outages and generator winding improvements at the Summer General Meeting of the American Institute of Electrical Engineers at Toronto June 25 to 29, 1951. Comprehensive survey of 689 transmission lines by a joint AIEE-EEI Committee showed lightning still the greatest adverse factor in performance. Meanwhile losses in transmission moved into closer equality with station losses as factors for consideration in scheduling capacity to match loadings on transmission systems.

New bases for rating circuit breakers to be consistent with clearing high-voltage faults were urged by users as well as manufacturers' help in rating FO-FA transformers for emergency loading when pumps and fans fail. New materials for advancing the scope of dry-type transformers and for averting tape migration in alternator windings were described and discussed.

Buried and trenched cable received attention in discussions of distribution systems devised to serve several recent Canadian housing developments.

All this goes to show that the 1840 registrants were served with subject matter that ranged over the whole gamut of electrical engineering technology.

TRANSMISSION

Analysis of Total and Incremental Losses in Transmission Systems. L. K. Kirchmayer, *General Electric Co* and G. W. Stagg, *American Gas & Electric Service Corp*

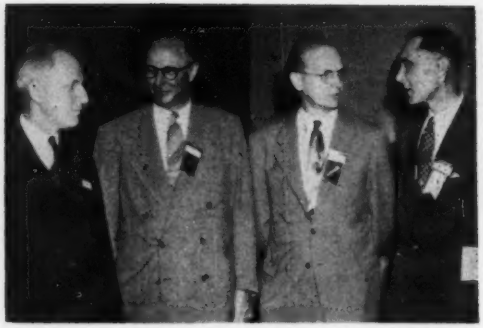
Develops a loss formula requiring fewer measurements and computations; based on evening and Sunday load conditions but not applicable to wide industrial variations.

The Torsional Damper for Conductors. T. J. Burgess and A. D. Hogg, *Hydro-Electric Power Commission of Ontario*

Satisfactory results reported from application on copper and ACSR conductors, steel ground wire and even on river crossing to prevent galloping.

Outage data reported by a joint AIEE-EEI committee headed by S. B. Crary and M. H. Pratt covered 21,594 outages of 689 transmission lines over 100 kv, reported by 62 utilities. The preliminary report embraces 33,796 miles and 236,666 mile-years. Lightning accounts for 64.6% of the outages. Temporary nature of 91% of all faults was construed as supporting the use of reclosure procedure. However, 67.9% of all outages produced secondary effects; 2% resulted in total system interruption and 10.4% caused some load loss. Line-to-ground faults predominate (58.4%). Many additional performance indexes are derived in the massive report. However, F. E. Andrews, Public Service Co of Northern Illinois, and S. K. Waldorf, Pennsylvania Water and Power, suggested the feasibility of expanding the analysis. A. E. Knowlton promised that "Electrical World" would repeat its 1929 survey showing the individual design characteristics of the country's transmission lines for correlation with the committee's analysis.

H. J. Scholz, Southern Services; J. G. Tarboux, Cornell; J. D. Harper, Alcoa; A. C. Monteith, C. G. Veinott, Westinghouse; D. D. Ewing, Purdue; A. H. Frampton, English Electric



W. R. Way, Shawinigan Water & Power Co; O. W. Titus, Canada Wire & Cable Co, Inc; C. G. Veinott, Westinghouse Electric Corp; and F. O. Wollaston, British Columbia Electric

Transmission losses on compact metropolitan systems can be ignored in establishing operations for optimum generation economy, according to M. J. Steinberg of Consolidated Edison. Another discusser warned that this was hardly true of less compact systems than that of Consolidated Edison. Steinberg foresaw the day when system operators will use punched cards not only to control load allocations but to control transmission losses.

Comment by A. S. Runcimann, Shawinigan Water and Power, on the Burgess-Hogg paper was that dampers apparently should not be placed systematically at anti-nodal points. This was based on tests on a messenger. Degree of tension was cited by several discussers as a criterion of safety against vibration and fatigue breaks. M. B. Elton, Bonneville Power Administration, reported finding 19 of 25 clamp points on a 115-kv line at 27% tension with up to four strands having fatigue breaks. No troubles were found where tension was below 15% or even 19% of ultimate.

TRANSFORMERS

Operating Problems of Forced Oil Forced Air-Cooled Transformers. A. L. Hough, *The Shawinigan Water & Power Co*

Despite reduction in capability it is unnecessary to remove an FOFA unit from service after complete loss of auxiliary cooling. Hotspot indicator then undependable. Self-cooled ratings desired as well as FOFA. Too much diversity in auxiliaries.

Inhibited Oils for Transformers. Herman Halperin and H. A. Adler, *both of Commonwealth Edison Co*

Doubled life as replacement in old transformer, tripled for new unprotected transformers. Economically attractive for replacement. No advantage in buying inhibitor to add to new or reclaimed oil. Deemed satisfactory for use in circuit breakers.

Relative Performance of Normal Oils With and Without DBPC Inhibitor in Semi-sealed Transformers. E. D. Treanor and E. L. Raab, *both of General Electric Co*

Indications so far are for considerable improvement in oil life when the DBPC inhibitor is present and oxygen is not excluded. No basis established for evaluation of benefits in transformers equipped with oil preservation means.

Field Screening Test for Judging the Condition of Used Insulating Oils. R. G. Call and W. L. Webb, *both of American Gas & Electric Service Corp*

Describes AG&E equipment and procedures. Of 2600 samples in 10 years 62% required blotter pressing only, 28% required reclamation by fuller's earth and 8% were deemed beyond salvaging.

The Application of Class-H Insulation to Transformers. M. L. Manning, *Pennsylvania Transformer Co*

Advantages detailed. Long life indicated. Allowable 180 C hottest spot proposed. Core loss 5% less at 200 C.

Hope that the manufacturers will raise the impulse strength of dry-type transformers was advanced by J. A. Elzi, Commonwealth Services, so that they can be used with less reluctance in station auxiliary and industrial service. B. M. Jones, Duquesne Light, wants to see the design extended to higher voltages and ratings. For 5 years Quebec Hydro has been using 4-kv dry-type regulators with excellent performance according to H. W. Haberl and he sees the use of more such equipment indoors in metropolitan areas. I. W. Gross, American Gas & Electric Service, reminded that resort to "Tailored" (preferred to "lowered") insulation should recognize that leads in 3-phase transformer have phase-voltage differences rather than the lesser neutral voltage. Nor in lowering basic impulse levels should sight be lost of the continuing significance of 60-cycle voltage margins.

Force-cooling was developed essentially for base-load and applications in attended substation said W. G. James, Westinghouse, and use in unattended stations is really special. Others agreed that top oil is never a good index of transformer temperature.)

Operator's problems are not always adequately considered by manufacturers in cultivating new developments nor was short-time rating contemplated for FOFA transformer after loss of pumps and fans. This came from W. B. Mallett, English Electric of Canada.

Inhibited oil, said H. Halperin, Commonwealth Edison, permits operation at considerable overload without excessive deterioration. H. A. Cornelius, Public Service of Northern Illinois, felt that oxidation has been unduly exaggerated citing that some 1338 power transformers over a 5-year period gave no failures attributable to sludge. Only 0.13% showed sludge and even then no clogged ducts.

SWITCHGEAR

Field Tests On Single-Tank 138-kv 2,500 mva Oil Circuit Breaker. G. W. N. Fitzgerald, *The Hydro-Electric Power Commission of Ontario* and D. F. Rankine, *Canadian General Electric Co*

Tests on a three-pole, single-tank, 138-kv 800 amp 2,500 mva oil circuit breaker establish ability to interrupt faults up to 4,500 mva. This exceeds any known test on a single-tank breaker.

William Deans, ITE Circuit Breaker Co; R. T. Henry, Niagara Mohawk; Walter B. Morton, Pennsylvania Power & Light Co; H. K. Sels, Public Service Electric & Gas; and J. D. Wood, ITE

C. T. Hatcher, Consolidated Edison Co; D. N. Farnham, Quebec Hydro Electric; R. J. Wiseman, Okonite; Herman Halperin, Commonwealth Edison; and L. I. Komives, Detroit Edison

Field Tests at Grand Coulee Dam on 10,000 MVA, 230 kv Low Oil Content Impulse Circuit Breaker. A. F. Darland and C. L. Killgore, *both of Bureau of Reclamation* with C. J. Balentine and E. B. Rietz, *both of General Electric Co*

Line dropping tests up to 300 miles made on 230 kv, 10,000 mva impulse breaker with no restrikers. Seven fault tests with short circuit duties up to 12,000 mva show interrupting times ranging from 1.75 to 3.0 cycles and reclosing times of 9 cycles. No distress on any test.

Interrupting Capacity Verification of 10,000 MVA, 230-kv Oil Circuit Breakers For Grand Coulee Power Plant. A. F. Darland and W. H. Clagett, *both of Bureau of Reclamation and* W. M. Leeds, *Westinghouse Electric Corp*

Short circuit interrupting tests to a maximum of 10,650,000 kva verify rated capacity of this type of dead-tank breaker and proved ability to successfully interrupt faults up to 12,000,000 kva. Charging currents to 100 and 300 miles of line interrupted in under 2.4 cycles.

Dissatisfaction of users with present methods of establishing breaker interrupting capacity was evident from discussion of the two papers on field tests of 230-kv, 10,000 Mva circuit breakers at Grand Coulee. H. Leyburn, Reyrolle & Co, England, said similar breakers in England would be rated on a symmetrical wave basis rather than on an asymmetrical basis as is the practice here. As a consequence such breakers would have a much lower rating abroad. British and US rating practice is out of step, he said, and should be brought into agreement before it becomes impractical to do so. Prof. E. C. Starr, Oregon State College, also urged revision of the test code to the end that uniform duty would be imposed on all circuit breakers, under like conditions. Random point-of-wave tripping, subjects breakers under test to a variety of duties which, under the present asymmetrical wave basis of rating, results in the same rating. He suggested that amperes times inches of contact separation, at time of interruption, would be a suitable method of evaluating breaker duty in proof tests. R. T. Henry, Niagara-Mohawk, urged caution in accepting present high breaker interrupting ratings. Ratings based on circuit interruption at the first current zero following a minor "loop" in an offset wave is not a true index of breaker interrupting ability.

INSULATED CONDUCTORS

Electrical Characteristics of a Three-Phase Delta Submarine Power Cable Circuit Using Earth as One Conductor. F. O. Wollaston, *British Columbia Electric Railway Co*

Third conductor in 3-mile 800-foot deep installation consists of sheaths of two phase conductors plus earth. Only 16% of current flows in earth. Performance deemed superior to 3-conductor cable.

F-3 Lead Alloy Cable Sheath—Effect of Bending and Creep on Life. L. F. Hickernell, A. A. Jones, C. G. Snyder, *all of Anaconda Wire & Cable Co*

Substantiated as superior sheathing material in tests which confirm wrinkles and expansion failure from excessive bending strains.

Cables for Vertical Risers. W. T. Peirce, *American Steel & Wire Co*

Discusses the factors involved in representative applications as bearing on method of support. Cable must be designed for vertical use and twist of elongation should be provided for.

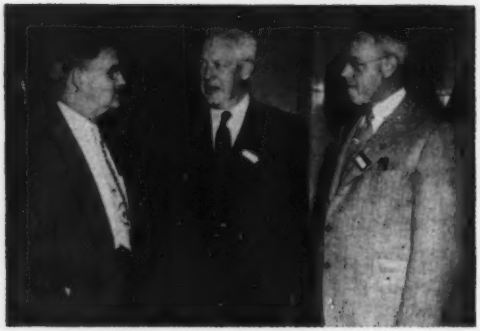
The Determination of Temperature Transients in Cable Systems by Means of an Analog Computer. J. H. Neher, *Philadelphia Electric Co*

Thermal circuit represented by network of shunt capacitances and series resistances to study short-time emergency ratings, load factor effects and oil flow.

Canada has, according to a conference paper by P. J. Croft, Canada Wire and Cable Co Ltd, three installations of underground distribution in housing developments which exemplify effort to bring the cost per unit near to that for orthodox overhead distribution. A loop in the rear of the houses is tapped into each residence from a pvc unjacketed set of conductors in a trench with concrete covers. For 186 houses of one project this averaged $130 per house vs $105 for overhead from the street. Total cost including equipment primary conduits and manholes was 2.27 times the corresponding overhead total for another project of 28 cottages.

Los Angeles Department of Water and Power, according to H. H. Cox, concurs in Croft's stand that the resulting beautification warrants some allocation of the excess cost of underground to the project developer or the individual owner. A 175-unit development there had a 2.15 to 1 ratio of cost.

W. A. Del Mar, Phelps Dodge Copper Products, warned that insect damage in United States areas might demand a 2 or 2½-ft trench rather than the shallow ones of the Canadian jobs. Philadelphia, said L. R. Gaty, lets the project developer do some of the work, eg, trenching and conduit laying, as his contribution to cost.



J. G. Tarboux, Cornell U., vice-president, Northeastern District; L. F. Kennedy, General Electric Company; and S. C. Bartlett, American Gas and Electric Service Corporation

B. M. Jones, Duquesne Light Company; W. R. Swoish, Penn, sylvania Transformer Company; J. R. North, Commonwealth Services Inc; and R. F. Danner, Oklahoma Gas and Electric

CARRIER CURRENT

Carrier Current Supervisory System For Distribution Circuits. L. Podolsky and S. Lubin, *both of Sprague Electric Co*

Describes scheme for supervising sectionalizing devices of distribution system by using centrally transmitted unmodulated carrier that is remotely modulated by equipment on load side of monitored sectionalizing device.

Application of Power Line Outage Monitor. John F. Atkinson, *Rural Electrification Administration* and James D. Cooke, *Central Virginia Electric Cooperative*

Experience with carrier current type power line outage monitors on two typical rural systems has shown ability to operate over distances up to 40 miles.

Signal and Supervision System Used On Carrier Current Communications Circuits. Robert Layon Mayer, *Pacific Gas and Electric Co*

Discusses signaling and supervisory trunking systems used in conjunction with normal operation of the authors' company. A number of the schemes are different than in other utility applications.

A Study of Carrier-Frequency Noise On Power Lines — I. Theoretical Considerations and Measuring Techniques. R. C. Cheek and J. D. Moynihan, *both of Westinghouse Electric Corp*

Authors describe studies of the theoretical aspects of noise leading to the development of measuring techniques and procedures. Companion paper gives results of series of field measurements of carrier frequency noise on actual transmission lines. A later paper will report effects of transmission-line noise on typical carrier receiving equipment.

A Study of Carrier-Frequency Noise On Power Lines—II. Results of Field Measurements. R. C. Cheek and J. D. Moynihan, *both of Westinghouse Electric Corp*

Second of a pair of companion papers. Findings of a series of measurement of carrier frequency noise levels on transmission lines ranging in voltage class from 44 to 230 kv show that such noise is predominantly impulsive, that general level of peak and average noise decreases with increasing frequency, that such noise levels reach values much greater than was supposed, that market changes in noise can be caused by switch operations and that there is no relation between voltage class and noise level.

British Developments and Applications of Carrier Current Principles for Operating Requirements of Power Utilities. W. D. Goodman, *General Electric Co, Ltd, of England*

Details of a wide band coupling equipment for use with carrier current. Preference is expressed for interphase coupling, due to lower attenuation and minimum attenuation with changing weather. Radiation is also less. Causes of noise on carrier traceable to leakage over insulators can be mitigated by use of a suppressed carrier system.

Transmission Considerations in the Coordination of a Power Line Carrier Network. G. E. Burridge and A.S.G. Jong, *The Hydro Electric Power Commission of Ontario*

Measurement and results of transmission factors and their consideration in the coordination of powerline carrier network. Authors conclude that noise voltages in the carrier frequency spectrum are proportional to power circuit voltage, that noise will increase linearly with frequency for both types of coupling.

Measurements and Tests on A Power Line Carrier Relaying System. R. H. Miller and A. R. Worthington, *both of Pacific Gas & Electric Co*

Staged fault test undertaken to test operation of carrier controlled relay equipment on 220 kv transmission system provides opportunity to measure noise under fault conditions.

F. M. Rives, General Electric Co, summarized in a conference paper the status of microwave developments, with particular reference to utility system applications. A minimum of 50-ft beam clearance around obstacles is necessary for satisfactory microwave operation, Rives said, but 100 ft is more desirable. With 50-ft clearance, a beam from a 100-ft tower can be transmitted 17 miles. A 200-ft tower height will give a transmission distance of 30 miles, a 300-ft tower, 39 miles.

T. A. Cramer, General Electric, drew from authors Podolsky and Lubin the fact that the Sprague carrier current power line outage monitor can cover a 25-mile radius with a transmission power of 25 w. J. D. Cooke, co-author of the companion paper, said experience with the monitor on the Central Virginia Electric Co-op showed that as many as 50 modulators could be associated with one carrier transmitter on a single system without trouble from too many successive modulations of a single carrier signal.

J. S. Smith, General Electric, found some lack in coordination between data and theroretical conclusions in the first of the pair of papers by Cheek and Moynihan. Like other discussers he pointed to the impracticality of measuring noise on an unterminated line since no absolute value of noise could be determined. Support was needed, he said, for the author's conclusion that noise conditions at one point on a system could be representative of noise on other parts of the system.

Conflicts in the data of the Burridge-Jong paper made general conclusions difficult and dangerous, according to R. W. Beckwith, General Electric Co, who cited unpublished data to show that phase-to-ground attenuation can be much less than phase-to-phase, for flat configurations. Attenuation, he felt, depends on configuration.

A. C. Hartranft, Philadelphia Electric Company; Leonard M. Olmstead, Duquesne Light Company, Pittsburgh; and N. L. Freeman, New York State Board of Engineering Examiners

L. R. Gaty, Philadelphia Electric Company; George H. Fiedler, Rochester Gas & Electric Corporation; and Pierce G. Fredericks, Pacific Electric Manufacturing Corporation, New York

J. L. Woodworth, General Electric, noted that while line-to-ground coupling is preferred in this country, phase-to-phase coupling, described by Goodman's paper, has the advantage of not disrupting communication on remaining phases when a fault occurs on the third. In closure Goodman added that phase-to-phase coupling reduces radiation in congested areas and that attenuation was less with such coupling when power was low.

PROTECTIVE DEVICES

A Lightning Arrester Application Guide For Substations and Stations. AIEE Subcommittee on Lightning Protective Devices

Preliminary draft of application guide intended to cover installation of station or line type valve arresters.

The Duty on Lightning Arresters for Ac Systems. Edward Beck, *Westinghouse Electric Corp*

Available data indicates that duty cycle test criteria for station type valve arresters include connection to 60-cycle source of equivalent voltage rating; 30 operations; 15 to 0 deg firing angle; and discharge current with crest of 10,000 amp, 5 to 15 microsec front, 45 to 60 microsec time to half value, and total duration to exceed 600 microsec. For line and distribution arresters, a similar but modified surge should be used.

Long Duration Surge Testing of Lightning Arresters. S. B. Howard, T. J. Carpenter and H. Schwartz, *all of General Electric Co*

Minimum requirements for long duration surge-withstand test for station type arresters should include five successive applications of a test surge consisting of four 150-amp 2,000-microsec surges applied in rapid succession, with no more than 15 min between each application.

Comments from users of lightning arresters are needed to give the proposed arrester application guide an industry wide scope. This request for utility opinion was voiced by H. A. Cornelius, subcommittee chairman, after considerable general and specific discussion of the application guide by manufacturers. J. E. Clem, General Electric, and Edward Beck, Westinghouse, both suggested that the guide be direct, brief and simple, and that it be an application manual prepared by the designers for the users. Clem pointed out that the guide could be divided into a section outlining application procedures and a section discussing the preparation of the guide and recommendations for its use.

Consensus of several discussers of the paper by Howard, Carpenter and Schwartz was that the proposed test include the condition of an energized power transformer across the arrester during the test. Ohio Brass reported that tests in their laboratory have indicated differences in lightning arrester characteristics when the devices are tested alone and across an energized 60-cycle source. This company suggested the use of a lump-constant generator, instead of a distributed-constant unit, to obtain a long-duration surge current which would more nearly match surges encountered in the field.

SYSTEM ENGINEERING

Savings Resulting From Automatically Controlled Capacitors Used In Conjunction With Generator Bus Voltage Regulation. D. R. Pattison and F. M. Reed, *both of Pennsylvania Electric Co*

Pennsylvania utility reports total annual net saving in using capacitors and generator bus voltage regulation for system regulations of $3,178,000.

In discussion of the Pattison-Reed paper, D. R. Sampson, G.E. suggested the coordinated use of switched high-voltage capacitors on the transmission and subtransmission system in combination with generator bus regulation and automatically switched capacitors on the distribution system as an economical approach to the problem of system voltage control. For such compact systems as that of the Duquesne Light Co in Pittsburgh, B. M. Jones said voltage regulation at step-down unit type substations, coupled with regulation at the generator bus, had been found best.

HYDROELECTRIC SYSTEMS

The Progressive Development of Hydro-Electric Stations on the Upper St. Maurice River. E. Van N. Leipoldt, *The Shawinigan Engineering Co, Ltd*

Reviews concept for integrating six hydro-electric stations, aggregating 1,250,000 hp, on the St. Maurice River. Radial system of transmission lines, paralleled only at the load center, considered most advantageous despite disadvantages inherent in line lengths ranging to 150 miles.

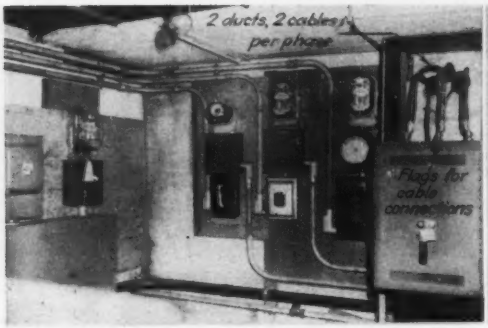
Prime Mover Equipment in New Ottawa River Developments at Des Joachims Chenaux and La Cave. A. E. Aeberli and G. F. Simson, *both of Hydro-Electric Power Commission of Ontario*

Details of major apparatus at the three sites being developed on the Ottawa River. When completed they will aggregate 900,000 hp.

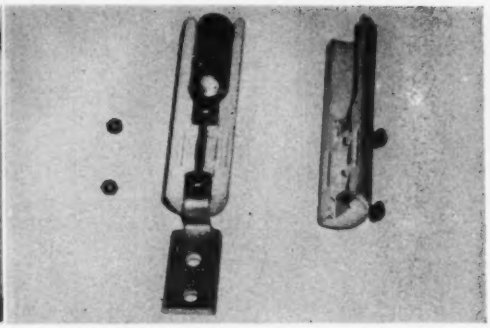
Modern Trends in the Design of Vertical Waterwheel Generators. C. M. Laffon, E. C. Whitney and R. A. Baudry, *all of Westinghouse Electric Corp*

Trend to enclosed ventilation with water to air heat exchangers, for larger machines noted. Umbrella construction widely used to cut maintenance and initial powerhouse cost.

(*Continued on page* 179)



1 TWO-CABLE service entrance provides for future growth. Breaker installation has two ducts, cables per phase



2 LIMITERS installed on system and service side of phase conductors on services having three or more paralleled cables

5 BREAKERS for the bus shown in Fig 4 are at either end of the bus. Current transformers will be installed in the bus from the load side of the breaker

6 MAXIMUM CAPACITY of 14 cables was provided in this installation

Services Modernized In Change to AC Network

RICHARD F. RICE, Engineer
Kansas City Power & Light Company, Kansas City, Mo.

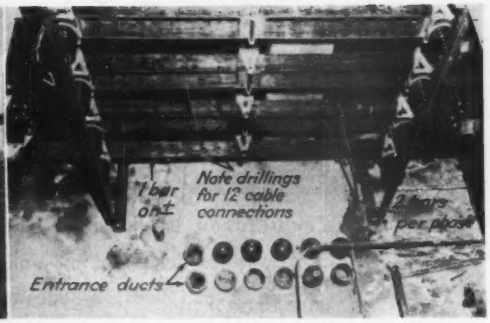
New service entrance equipment will give customers in downtown area better service. Flexibility of equipment provides for capacity to serve future growth in lighting and air conditioning loads

Modernization of service entrances was one of the very worthwhile accomplishments in Kansas City's change from the Edison dc system to ac network service in the downtown area. Existing dc circuits were in alleys but due to congestion there, the ac network was installed in the streets. This required rerouting all services.

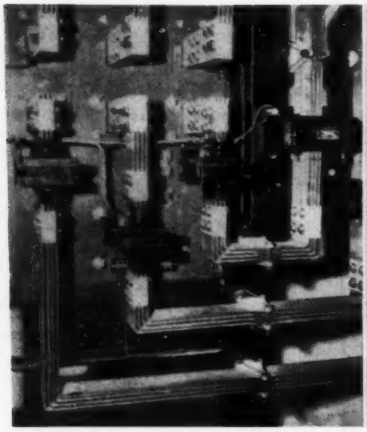
Design of network services called for 500 Mcm for each phase conductor with one 4/0 neutral to serve a given load. The standard design was adopted to avoid stocking a number of different sizes of cables.

For larger loads two or three 500 Mcm cables were installed per phase. Since carrying capacity per cable goes

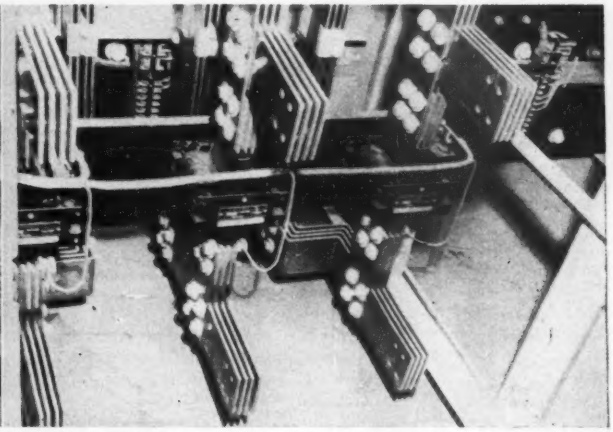
3 **BUS STRUCTURES** show arrangement for terminating four cables. Only one cable had been installed at this time



4 **SERVICE ENTRANCE BUS** shows drillings for connecting 12 cables. There are two bars per phase, one on neutral



7 **DISCONNECT LINKS** for ct's, and ct's, are shown on back of 3,000 amp breaker



8 **CURRENT TRANSFORMER INSTALLATIONS** provide flags for jumpers to be installed when current transformers are taken out of service

down as the number of cables in parallel goes up, load served on one service entrance was limited to 1,000 kva, 14 cables. If load was larger than 1,000 kva, a second service entrance was required.

Conduit runs were designed to have a sufficient number of ducts to serve the ultimate demand of the building. This was calculated at 10 w per sq ft, 5 w for lighting and 5 w for air conditioning. Only enough cable capacity was provided to serve existing loads.

Examples of what was accomplished are shown in the illustrations. Fig 1 shows an 800-amp air circuit breaker installation with two ducts and two cables installed per phase.

Services with a maximum of two cables have a limiter on the system side of each phase conductor, Fig 2. Services with three or more cables paralleled have limiters on both system and the service side of each phase conductor.

Bus structure for terminating four cables is shown in Fig 3. Only one cable has been installed.

Service entrance bus and 12 service ducts, Fig 4, had only 5 cables installed at this time. The remaining 7 ducts will be available to take care of load growth. Breakers for this bus are shown in Fig 5. Current transformers will be installed in the bus from the load side of the breaker. Short pieces spliced in will be used as disconnect links when it is necessary to take a breaker out of service.

Service entrance of maximum capacity, 14 cables, is shown in Fig 6. All phase conductors are terminated with limiters in this installation. To provide good electrical connections the bus has been silver plated where the lug of the limiter is to be connected.

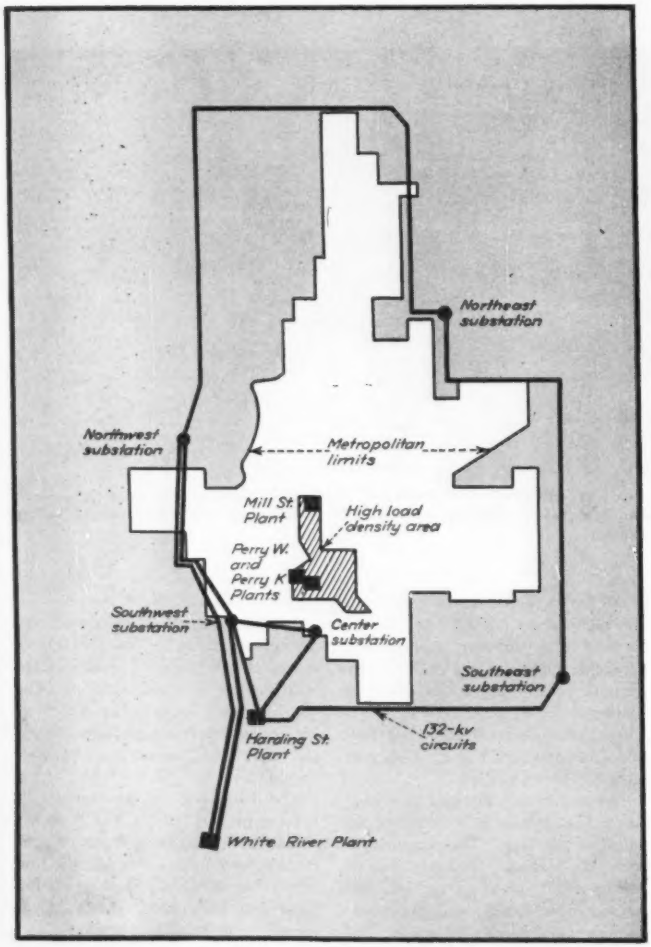
The back side of the 3,000-amp breaker on this service, Fig 7, shows the disconnect links in the bars connecting the entrance bus and the line side of the breaker. Here again the bars have been silver plated at all joints.

Typical current transformer setup, with flags for jumpers, is shown in Fig 8.

We Cut Substation Costs 30% By Simplifying Design

Fewer circuit breakers are made practical by short outgoing 34.5-kv lines designed for high reliability. Proximity of substation to load center reduces outgoing feeders from ten to six

J. R. JORDAN,
Planning Division, Engineering Dept
Indianapolis Power & Light Co

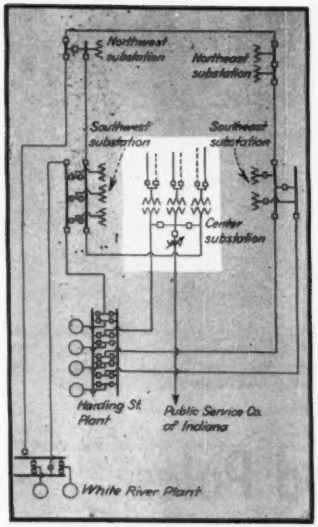


TRANSMISSION RING around the city of Indianapolis ties Center substation with four outlying substations and two generating stations. Power from these two stations is transmitted over 132-kv and 34.5-kv lines to load centers

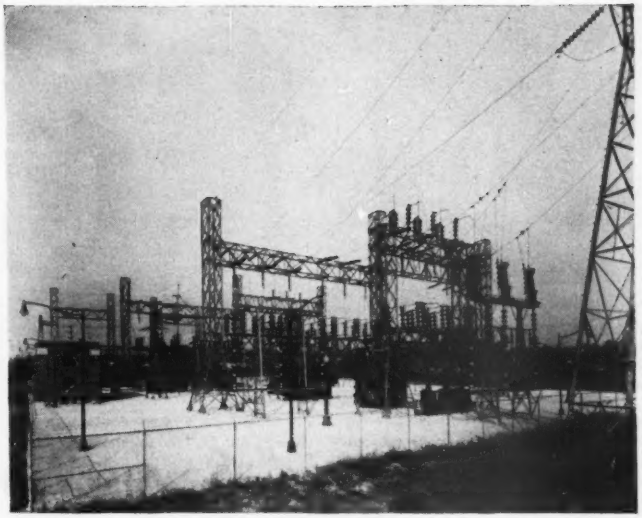
Simplified design for Indianapolis Power and Light Co's Center substation allowed a 5% reduction in cost over that of an equivalent older substation of double-bus construction, and 30% over that of an equivalent substation of double-bus design at present day costs. The unitized scheme employs only three 132-kv breakers and six 34.5-kv feeder breakers on individual buses. This minimum use of switchgear allowed a site of limited area to be chosen for the substation.

Use of fewer breakers was considered practical because transmission lines to the substation are only three miles long. Line design is such that outages should be limited to 0.017 per year for each of three transmission circuits. In addition, subtransmission network arrangement is such that a 132-kv line, its associated transformer bank and the two 34.5-kv lines feeding from that bank may be out of service without overloading any other line or transformer bank, even during peak load periods. Center substation has two 30-Mva banks now in service and a third bank scheduled for service early this year.

The Indianapolis system, up to the present, has had a peak load of 313 Mw. At least 90 Mw of this can be generated at three 4-kv plants inside the city. The bulk of the load is normally supplied from two plants outside the city through a 47-mile 132-kv transmission loop around the city and a 34.5-kv subtransmission network. Previous to the installation of Center



CENTER SUBSTATION of unitized design requires only three 132-kv breakers and six 34.5-kv breakers



OVERHEAD LINES rated at 132 kv bring power to Center substation, although it is only 1¼ miles from load area in the business center of downtown Indianapolis. A third 30-Mva bank for the substation is scheduled for installation this year

substation the transformation from 132 to 34.5 kv was made at four substations located at the corners of the city. Subtransmission interconnects these substations with plants inside the city and supplies the 34.5-kv distribution substations.

Selecting a Site . . . Economic expansion of generating plants in Indianapolis is limited by the supply of cooling water. Hence, additional power is generated in new plants outside the city and transmitted through additional 132-kv and 34.5-kv circuits. Postwar load increases thus far have been absorbed by the addition of two 30-Mva banks in existing substations. Further expansion of these stations would be expensive because congestion in surrounding areas required underground installation of some of the 34.5-kv lines. Present load densities close to these substations are not high enough to justify underground lines.

A major factor in picking a location for Center substation was the heavy concentration of load in the downtown area. Previously, the closest 132-34.5-kv substation was 2¾ miles from the downtown area. Center substation is only 1¼ miles away. This was the closest point that could be reached with a tower-line.

Placing this type of substation in a congested area created a serious problem in obtaining routes for 34.5-kv lines. Extensive studies on a network analyzer indicated that by installing high capacity circuits to heavy load centers only six lines would be needed. This compares with an ultimate of ten lines scheduled for an older 90-Mva substation more remotely located. Three of Center substation's circuits are 397-Mcm, 18/1, ACSR overhead conductor. The other three are underground using 3/C 600 Mcm gas-filled cable. One of these underground circuits is scheduled for installation in the fall of this year.

The subtransmission arrangement was also worked out on a network analyzer. It was found that 34.5-kv bus tie breakers were not needed. In fact, it would be undesirable to have the bus ties closed. As may be seen in the substation diagram, two lines, one underground and one overhead, are connected to each 34.5-kv bus. Each line is heavy enough to carry the full load of one bank under emergency conditions.

Line Loading Limited . . . With the buses tied, some lines would be overloaded under certain outage conditions. This is due to the compactness of the subtransmission network. Impedance of this network is low in comparison with that of the 132–34.5-kv transformer banks. Outage of one line does not alter bank loadings to a great extent. By keeping banks on separate 34.5-kv buses, line loading is limited to the capacity of a single transformer bank.

One 132-kv circuit to Center substation is an emergency interconnection with another electric utility system. A three-phase voltage regulator in this line permits the two systems to operate independently, as far as voltage is concerned, without interchanging large amounts of reactive power. The regulator will regulate 50 Mva ±10% with forced air cooling. As much as 100 Mva may be passed through the regulator when it is set on neutral. Thus it would not be necessary to by-pass the regulator under extreme system emergency conditions.

Station Unattended . . . Even with an installed capacity of 90 Mva, Center substation will be unattended. Remote operation is obtained by an extensive supervisory control system. It provides for operation and supervision of all circuit breakers and the voltage regulator. Provision is also made for automatic synchronization of the emergency tie line.

FIG 1—GOOD ADHERENCE of "filling" to wood is shown on inspection three years after treatment. Note roofing paper cover on top of pole

FIG 2—RETENTION of pentachlorophenol five years after treatment was 0.24 lb of dry penta per cubic foot of wood. Paper cover has been turned back

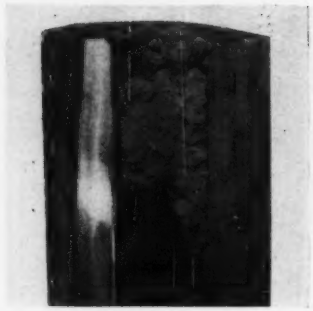


FIG 3—TESTS show retention of 0.13 lb of dry pentachlorophenol per cubic foot after six years. Sample of wood was taken two feet below pole top

"Dentistry" Saves Wood Poles Stops Pole-Top Heart Rot

Decay of pole tops is eliminated with pentachlorophenol fly ash paste. Six year study of treated tops of Western red cedar poles shows good results. Method is economical

B. J. BARMACK, Line Design Division, Engineering Department
Commonwealth Edison Co, Chicago

Investigations begun in 1942 disclosed that hundreds of standing Western red cedar poles on this company's system had heart rot in their tops. Most of these poles were 11 to 18 years old. It was apparent that the 90-deg method of roofing poles did not prevent decay and that enough water was retained in the untreated pole tops to promote the development of fungus growth. Full-length treated poles now purchased are roofed flat.

Method of Treating . . . In a previous article on this subject (Electrical World, December 23, 1944) the method of treating partially-rotted pole tops devised by the author is described in detail. In brief, this method consists of cutting off the top of pole about one in. below the 90-deg roof and removing the decayed wood from the hole to expose sound wood. The next operation is to sterilize the exposed cavity by pouring into it a pint or a quart, or more, of the 5% pentachlorophenol-petroleum oil solution such as is generally used for pole treatment. Then a paste, prepared of fly ash and pentachlorophenol solution, is poured into the cavity. This paste is made sufficiently thick to set properly but still thin enough to allow pouring. Usually, the checks in the pole are not wide enough to permit the paste to run out, if it is not too thin.

Finally, the "filling" is protected from the elements by tacking a piece of slate-surfaced roofing paper to the top of the pole. Precautions are taken to prevent contact between the paper and the paste.

Pentachlorophenol Content, Lb Per Cu Ft of Wood

	Transverse Sections				
	Section 1	Section 2		Section 3	
Pole No.	Top 2 in. of pole	About 7 in. below Section 1		Just below bottom of cavity	
	a	a	b	a	c
1	0.27	0.23	....	0.16	....
2	0.23	0.15	0.12	....	0.03
4	0.24	0.19	0.02	....	0.02

(a) Letter "a" denotes drilling taken up to ½ in. from the inner surface of the hole (except where no hole was present in the section).
(b) Letter "b" denotes a drilling taken between ½ to ½ in. from the inner surface of the cavity or hole.
(c) Letter "c" denotes drilling taken from the center of the section because there was no hole present.

Cost of Treating . . . Cost of material is very small compared to labor costs involved. In 1944, these costs were estimated to be $0.20 for material and $8.80 for labor, transportation, and supervision. In 1950, these costs were somewhat higher, but in view of the

FIG 4—DECAY was stopped along pith below "filling" by generous application of pentachlorophenol-petroleum oil solution prior to filling the top with pentachlorophenol flyash paste

FIG 5—DEPTH of pentration of pentachlorophenol solution is shown in section cut from pole after removal from service, several years after treatment

higher cost of new poles and labor for replacement of poles and equipment this method is still very economical. To date about 2,000 poles have been treated in this manner.

Inspections Show Results . . . About one year after the first pole top was treated, borings were taken about 6 in. from top of pole. The inner ½ in. of the borings contained as much as 0.36 lb of dry pentachlorophenol per cu ft of heartwood.

Fig. 1 shows a section of the top of a cedar pole set in 1925, treated in 1945 and removed three yr later. The fly ash-penta "filling" adheres well to one-half of the split pole.

Fig. 2 shows a section of a typical pole top with treatment included in this study. This Western red cedar pole was set in 1930, the top was treated in 1944 and the pole was removed 5 yr later. The amount of dry pentachlorophenol in the heartwood of this pole, No. 4 in Table, is 0.24 lb in the first ¼ in. from the inner surface of the hole.

Fig. 3 shows treatment in a pole with a hole 3½ in. in diameter extending for several ft. Only the top 8 or 10 in. were plugged. The rotted wood, about 2 ft from top, contained 0.13 lb per cu ft of pentachlorophenol. The pole was treated in 1943 and was removed 6 yr later. All of these poles were removed because of need for change in pole size or location, change of facilities, or for other service reasons and not because of further decay after treatment. Examination of the cavities of these three sections disclosed no decay present.

Examination of a number of pole tops after the cavity was cleaned of the decayed wood insofar as practicable, showed that the decay along the pith of the pole may extend down for several in. or, perhaps, several ft as can be seen in Fig. 4. Therefore, a generous amount of liquid pentachlorophenol is poured into the opening in order to sterilize not only the bottom of the cavity but also the decay along the center portion of the pole.

Fig. 5 shows the depth of penetration of oil into the heartwood of the Western red cedar pole.

To determine the residual pentachlorophenol, sections were cut, approximately 2 in. in thickness, from each of the pole tops. Drillings were taken for analysis from the inner surface of each section ¼ in. deep and in some instances between ¼ and ½ in. deep.

Results of the determination of pentachlorophenol by the sodium peroxide fusion method given in the Table tend to show that a greater amount of pentachlorophenol is absorbed by the upper section of the pole than at the lower levels. It is also indicated that pentachlorophenol is absorbed and remains in the wood for a long period of time after this treatment. It should, therefore, have a lasting effect by arresting the decay of wood at the point of application.

Appendix: Determination of Pentachlorophenol in Treated Wood By the Sodium Peroxide Fusion Method

Samples of the wood are taken by boring or drilling to the desired depth. The wood borings are finely divided by grinding in a coffee mill. 0.15 to 0.4 gram (accurately weighed on an analytical balance) of the wood flour and 0.5 gram of finely powdered sucrose are charged into a Parr peroxide fusion bomb and are thoroughly mixed. Fifteen grams of sodium peroxide are added, the bomb closed, and the contents of the bomb are vigorously shaken to mix the charge.* The charge is electrically fired. After cooling for a few minutes, the contents of the bomb are leached out in approximately 100 milliliters of boiling water, boiled for 10 minutes, cooled, and slightly acidified with concentrated nitric acid. The chloride content of the solution is determined by precipitation with silver nitrate and titration with thiocyanate (method of Volhard).** One milli-equivalent of pentachlorophenol = 0.05327 grams.

* Potassium nitrate (approx. 0.75 gram) may be added as an accelerator.

** W. H. Hillebrand and G. E. F. Lundell, *Applied Inorganic Analysis*, page 589. (New York; John Wiley & Sons, Inc, 1929).

The Power Salesman's Opportunity In The Defense Program

Here's what industrial power engineers can do for industrial customers to help them and the defense effort. One of their most important jobs is to stay with the "little fellows," interpreting to them the market needs in terms of the goods and services they are equipped to supply

CLARENCE T. SHOCH, Manager, Industrial Sales Department
Pennsylvania Power & Light Co, Allentown, Pa.

There's always an emergency! Or at least that's the way it has seemed ever since I've been in power sales. True, not all of the critical times so far experienced have been of the same magnitude, or even of general concern. But whether the immediate problem has been strictly local such as loading up idle generating capacity or recouping after a rate reduction, or of national scope and significance such as World War II, we have always been girding ourselves for a new fight. Perhaps this is as it should be. For power salesmen are America's exponents of industrial opportunity, and to get anywhere as opportunists our philosophy must be that the present is in fact the past, and what remains to be done is all that counts.

When I am confused, as I am now about today's conditions, I find it helpful to let the present alone and deal in terms of what I can do next that will be constructive. Stopping with today just long enough to get our bearings, we know that our productive capacity has been saddled with the double job of quasi-war or long-range defense, and business more-or-less as usual. The degree to which each of these is to be carried out is not so clear. Varying estimates of the war-defense portion run from $40 to $70 billion annually on top of the current $270 billion for civilian purposes.

Capacity for Production. . . . We are told, alternately, that production for civilian needs is "out," and then "in"; that there won't be enough critical materials to go 'round, then that there will be. Sifting through this haze is the growing realization that the one thing that will keep America strong is the characteristic that made it great in the first place—our almost unlimited capacity for production. We seem to be facing a four-part emergency—to strengthen defense, pay for it as we go, check inflation, and minimize restrictive legislation. In consideration of this we had better be prepared to exploit fully our production advantages.

Last year's business level was $280 billion, including some defense. This year's stepped-up defense added to civilian uses would land us at a level of about $310 billion —only 10% above 1950. Last year's 7% gain over 1949 was made without any change in the 40-hr work week, and only an occasional adoption of two-shift and three-shift operations. We are truly on the verge of having "guns and butter." The accomplishment of this double standard of living is the major overall opportunity for the power salesman in the defense program.

However, the nature of our industrial progress has always been one of backing and filling by the various segments as overall production moved ahead. In a time of maximum effort it becomes increasingly important to match the capabilities and to time the efforts of all concerned. This is where we find the day-to-day opportunities that make the overall guns and butter objective seem plausible.

It will be our job—our responsibility—to continue to encourage plant owners and operators to take advantage of all modern production tools to effect the maximum output of goods. This increased output will be of better quality as well as at lower cost. The machine tool builders are our allies. Also, the government maintains a large stock pile of machine tools and motors that are available to help bring plants up to modern levels of efficiency.

Labor Situation. . . . We have noted the 10-year increase in the number of production personnel available to industry.

These Publications Will Help Power Salesmen Advise Customers

Name of Publication	Where to Obtain It
How To Sell To the United States Army	Superintendent of Documents, U.S. Government Printing Office Washington 25, D. C.
A Guide For Selling To The United States Air Force	Superintendent of Documents, (Same address as above)
Selling To The Navy	Superintendent of Documents, (Same address as above)
Index of Military Purchasing Offices	Central Military Procurement Information Munitions Board, Pentagon, Washington 25, D. C.
How Do You Get a Defense Contract?	The Philadelphia Inquirer, Philadelphia, Pa.
U. S. Department of Commerce Consolidated Synopsis of U. S. Government Procurement Information (Daily)	U. S. Department of Commerce, Field Offices
U. S. Department of Commerce Consolidated Synopsis of Contract Award Information (Weekly)	U. S. Department of Commerce, Field Offices

Adapted from paper presented at recent P.E.A. Industrial Power Conference

Here Are 10 Important Things To Do

1. Scan the various bid invitations and match with known customer capabilities. Call customers who should be interested. If this survey indicates that the customer could make only a part of the item, watch for an opportunity to subcontract. To help in this survey we have prepared an up-to-date product directory of the industries in our territory.

2. Scan the contract award information. If one of our customers gets a prime contract, call him to learn if he will need subcontractors. If so, help him to locate them. Also, watch for out-of-the-area awards where our customers might work their way in as subcontractors. Our Product Directory also makes this job simple.

3. Where customers lack certain machine tools, help them gain access to the Government's machine tool and motor stockpile.

4. Help customers get acquainted with the local NPA agent or the Small Business Specialist. Their knowledge of production requirements will dissolve many fancied difficulties. Tell customers about the Defense Procurement exhibits being sponsored in many metropolitan areas.

5. Help customers with their listings of production facilities as an aid to securing prime or sub-contracts. This will help them get on procurement mailing lists. In this connection the Chamber of Commerce of Greater Philadelphia has made available "Record Facility Cards" which may be obtained upon request to their office.

6. Look for unused plant space or idle buildings which could be put to work to accommodate expanded production. Match these up with known plans of others to expand.

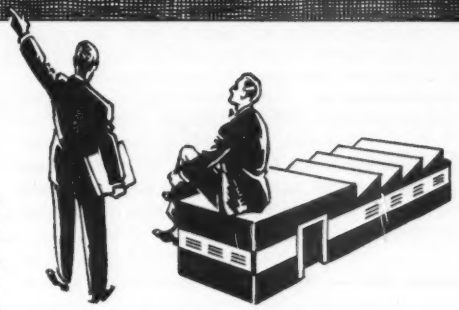
7. Counsel with customers on their financial ability to proceed. Many have been helped in finding necessary backing.

8. Act as a coordinator in having small industries get together on an area basis for dealing in larger-than-usual contracts. Encourage some large industry to spearhead the activity. Our Product Directory is also helpful here.

9. Encourage procurement agencies to call on you for help in locating a manufacturer or supplier for some hard-to-get item. These agencies get a copy of our Product Directory.

10. Sponsor industrial forums which bring customers a greater know-how in faster, better, and cheaper ways of producing.

CHECK LIST of things to do for industrial customers to help them in their defense efforts. PP&L power sales representatives are doing these things daily

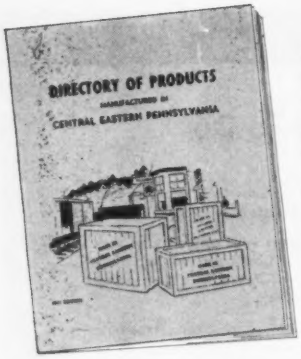


However, the demands for military personnel will drain off employables. The intensive recruitment programs of large industries will use up most of those remaining available. Therefore, our smaller manufacturers will find it increasingly difficult to keep up their staffs of workers. Labor pirating is almost sure to throw many small plants into inactivity. Counsel now with these to take a realistic look at their employment procedures looking toward keeping employees satisfied in their present places. Wages, working conditions, training programs, incentive pay, fringe benefits, source of labor supply, job deferments, "esprit de corps"—all need a thorough going-over if the labor force is to be retained at a productive level.

Our experiences in labor shortages will accent the need for modernizing the machinery of the plant to make it possible to keep up production schedules while using less and less labor. It will be a real challenge to our industrial engineering ability to match up existing manpower and modernized plant tools and equipment, so that our smaller producers may operate at reasonably efficient levels, or in some cases, operate at all. As an example of how modern machinery and the efficient utilization of labor work, the new Fairless Plant of U. S. Steel is expected to require only 2.44 men per 1000 tons of annual production. The average of this company's plants in 1947 was 5.64 men per 1,000 tons. Thus, a 56% reduction of the average is in prospect.

Increasing Productivity. . . . Other indicators reassure the power salesman that his work advances the cause of "peace by production." These are: the increasing productivity of industrial manhours, now going up about 3% annually due largely to mechanization; and the degree to which power consumed by industry takes the place of hard-to-get, expensive manpower.

The power salesman has a large stake in knowing, inti-



PRODUCT DIRECTORY published by Pennsylvania Power & Light Co supplies comprehensive data on the products manufactured in the area served by them. This is invaluable to power sales representatives in helping customers get defense contracts

mately, of the government's plans for controlling the use of critical materials and manpower. The defense segment of industry has been operating under a DO system. This is a sort of priority which gave the manufacturer a license to hunt for the materials he needed. On July 1, the much-heralded CMP (Controlled Materials Plan) became effective, covering steel, copper, and aluminum. It applies chiefly to the plants using these basic metals. CMP, it will be remembered, was introduced toward the end of the last war and eventually outgrew the popular misconception that it meant "Confusion Made Permanent." Whereas DO's are restrictive, or negative in approach, CMP accents the positive by assuring defense and its programs of needed materials. At the same time it sees to it that such demands don't become greedy and thereby disrupt the civilian economy.

Our problems, locally, are going to be to help in the equitable distribution of raw materials so that small and large plants, alike, may continue to make maximum production contributions. The greatest disruption of non-defense manufacture is expected in the third quarter of this year. At that time, defense and special programs plus essential needs will take close to 75% of the steel output. This would leave little for a host of civilian essentials such as washing machines, cars, radios, and refrigerators.

Allocation Aid. . . . We can be of great service to plants faced with idleness for lack of foresight to get an allocation under CMP. In this connection it is well to remember that the National Production Authority will require the filing of needs by producers for the military, certain defense-related construction, and manufacturers of other products using basic metals. Filing by consumer durable manufacturers—autos, ranges, refrigerators, etc—is not sought. Parts makers must file.

I referred above to "small and large" plants. Comparing the problems they face in the defense effort, I am reminded of the old saying that "he who has, gets." A reference to the part played in World War II by manufacturing plants shows that of some 230,000 such units in this country, less than 100 got three-fourths of the prime contracts issued by the government for war material and equipment. Only 6,000, one in 40, received a prime contract. Your service area and mine have many, many more small plants than large. We'll have to do all we can to improve that ratio this time. If we can't help the small ones work their way into the picture individually, possibly we can have several of them band together in a sort of "York Plan." Otherwise, there just won't be guns and butter.

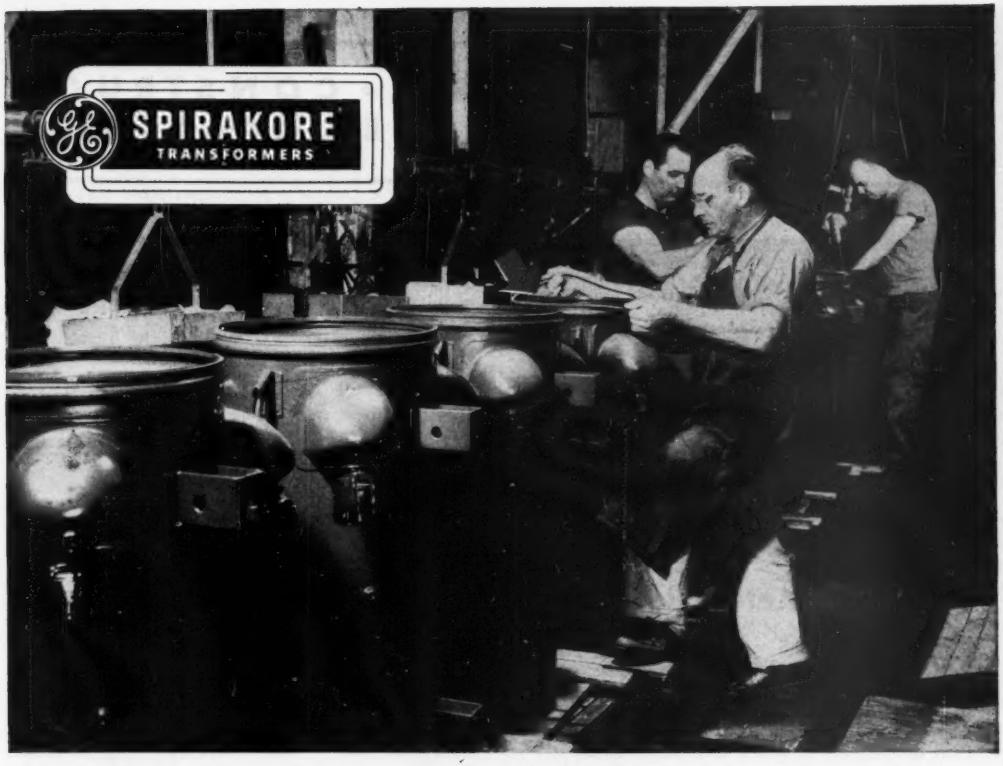
Small Plants. . . . Wherein is the small plant lacking in its ability to sell itself to the defense effort? Mainly, it is in its modest estimation of importance, belittling itself as to its accomplishments, its potentials. Growing also, unfortunately, is the attitude that a paternalistic government will take care of finding its markets. Our job is to stay with the "little fellows," interpreting to them the market needs in terms of the goods and services they are equipped to supply. For example we know, and in general our industrial customers know, of the items needed for defense. Many of these are listed on the U. S. Department of Commerce releases. Other sources of information are the various military purchasing offices. We should welcome the opportunity to call our customers' attention to every possibility to participate in the bidding for war orders. Help them make adaptations, material substitutions, slight changes in design or tolerances, or to overcome any other of the temporary obstacles that cause small plants to throw up their hands in dismay and resignation when faced with the unfamiliar government method of negotiation.

A check list of the kinds of things our men are doing daily in support of the guns and butter economy is included in this article. All of this activity starts, of course, with a thorough knowledge of customer equipment, processes, raw materials, and products. A look-around locally, plus a little resourcefulness, will expand this list of worthwhile activities to the satisfaction of every conscientious power salesman. As background material it might be well to keep in your brief cases a copy of the procurement aids also shown. These are but a few of the great number of helpful procurement aids available.

Service to Customers. . . . It is no mere coincidence that we have avoided mention of the opportunity for increasing power sales as the result of the defense effort. Our first consideration in this time of "changing uncertainties" must always be that of service to our customers. Will MacCalla's recital in March 12, 1951 "Electrical World," pointed out that customer assistance really pays dividends and, I might add, usually at a time when new loads are needed most. Helpful work among customers provides the broad base of good relations from which can be projected our load-building programs with assurance of success, the customers and ours.

Most utility companies have completely rebuilt their power sales departments over the five-year period since the last war. Careful attention to screening and final selection has resulted in personable groups, with capacity to sense customer needs and a corresponding natural curiosity to find solutions.

It is but a natural step for this group to respond to the patriotic urge of a military crisis. The nation is fortunate indeed in having qualified men looking after an important phase of its industrial might. The need now is for men who look upon opportunity as responsibility. Of such are power salesmen.



AIR-TIGHT SEAL MAKES SPIRAKORE* TRANSFORMERS LAST LONGER

Breathing is stopped in General Electric Spirakore transformers. A Nitrile rubber gasket—resistant to oil, age, sunlight, or operating temperatures—seals every opening in Spirakore transformers. Sealing is so complete that hottest summers and coldest winters won't draw moisture or dust into the tank. Transformer life is prolonged.

With this sealing *accessibility is actually improved.* Unclamp the tank cover and it lifts right off. No adhesives to break—no surfaces to clean before resealing. You even re-use the gasket.

This better sealing is only one of the reasons why Spirakore is the finest transformer you can buy. The full story is told in our new bulletin GEA-5400. If you haven't received your copy ask your G-E representative, or write *Section F 402-103, Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

* Registered trademark of the General Electric Co.

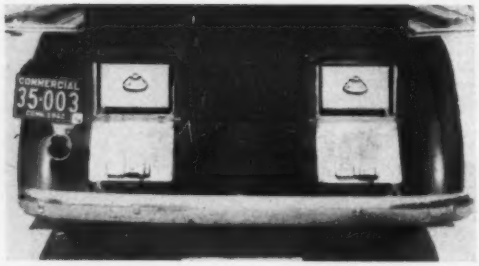
On large tanks, Nitrile rubber gasket of circular cross-section is compressed as shown. A ring welded to the tank keeps the gasket in place and prevents too much compression.

On small tanks, a Nitrile rubber gasket of square cross-section is compressed between rim of cover and deep-rolled flange on tank. Shown uncompressed.

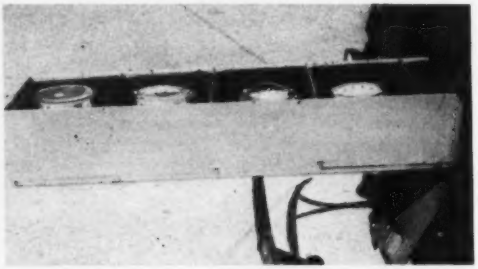
402-103

GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



PUSHED IN after meters have been withdrawn or replaced, drawers are kept from sliding out by doors with snap locks



PULLED OUT for removal of meters, special drawer lined with sponge rubber places meters at convenient handling height

Meters Ride in Protected Compartments

Protected compartments for carrying both electric and gas meters in a truck without shock and at normal operating speeds on the road have been designed by Stamford division of Connecticut Power Co. All meters are protected by sponge-rubber-lined compartments nested in drawers. Before the sponge rubber is installed, drawers measure 49 in. x 14 in. When lined, the drawer is 8¾ in. wide.

Depth of each bin from the back to front is 8⅝ in.; from the top to bottom the drawer is 7¼ in. deep. Drawer holds five meters. It is supported on rollers and is equipped with adjustable stops to prevent it from coming out all the way.

Gas meters are carried in sponge-rubber-lined compartments in side panels of truck.

Shield Eliminates Hazard of Blowback

J. G. PECK
Station Superintendent
New York State Electric & Gas Corp
Bainbridge, N. Y.

A protecting shield of sheet metal eliminates hazards to personnel and equipment in case of blowback of fire from travelling-grate stokers at Hickling and Jennison steam stations of New York State Electric & Gas Corp. Without such shields, a ruptured tube in the boiler, superheater, furnace wall or arch could build up sufficient pressure to blow the entire fuel bed off the grate, blasting incandescent coal, ash, and gas out between coal gate and stoker directly into the boiler and turbine room. Shields are hinged to open inward only.

Shield assembly at Jennison Station consists of eight separate shields of 3/16 x 10 x 36-in. cold rolled steel, thus covering the 24-ft long grate.

PROTECTING SHIELD prevents blowback of fire from boiler fed by travelling-grate stoker. This safety device is being inspected by William R. Wise, superintendent of Hickling station of New York State Electric & Gas Corp at East Corning

In operating position, shields ride on the moving grate. An operating rod permits raising of each shield to facilitate removal of frozen balls of coal or foreign material. A latch is being devised for the operating rod which will hold the shields open.

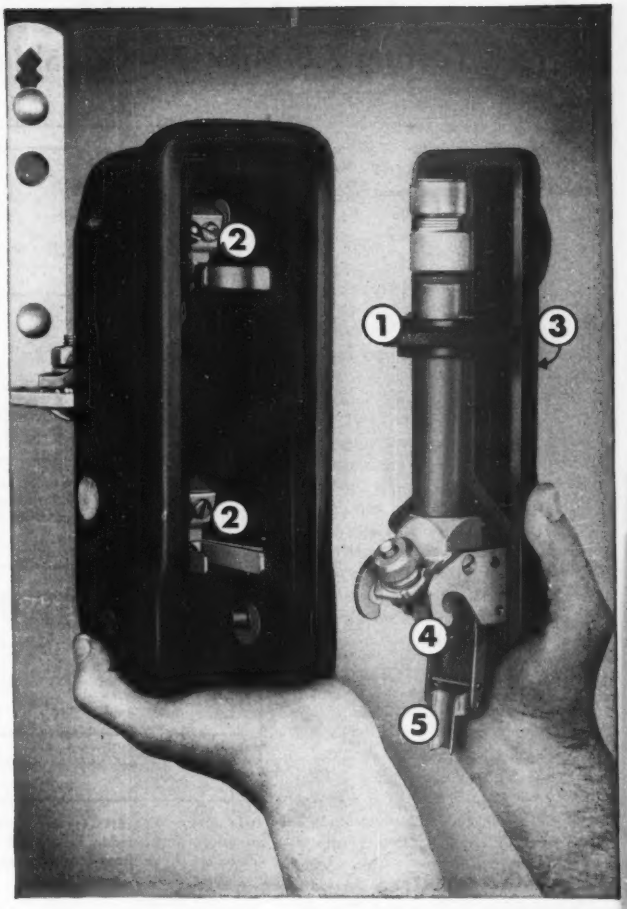
1. **FLASHOVER PREVENTED** by a neoprene-sealed barrier between top and bottom contacts.

2. **REINFORCED CONTACTS** and double-clamp terminals for 2/0 conductor are silver plated.

3. **CLEAR IDENTIFICATION** is assured by white disk monogram on front of door which assists in zoning applications.

4. **RECOIL CUSHIONING** is achieved by springs located between the door and hinge assembly.

5. **POSITIVE INDICATION** of blown fuse is given by a double spring-operated indicator arm.



Lowest-priced 100-ampere fuse cutout for high-capacity feeders

This General Electric 100-ampere heavy-duty fuse cutout gives you:

- One cutout for either 50-ampere or 100-ampere requirements
- Positive full-range operation with any fuse link up to and including its 100-ampere rating
- Reliable interruption up to 8000 amperes at 2.5 kv, 5000 amperes at 5.2 kv

Yet its price is no more than that of its *50-ampere* predecessor.

You'll like the economy and reliability of this G-E cutout for your high-capacity feeders. See your local G-E representative for complete information—or write for Bulletin GEC-704, addressing *General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

406-41

Testing 7.5-Mile, 25-Kv Cable in RR Gondolas

H. B. SLADE
and
F. H. GOODING
Test Department
Okonite Co
Passaic, N. J.

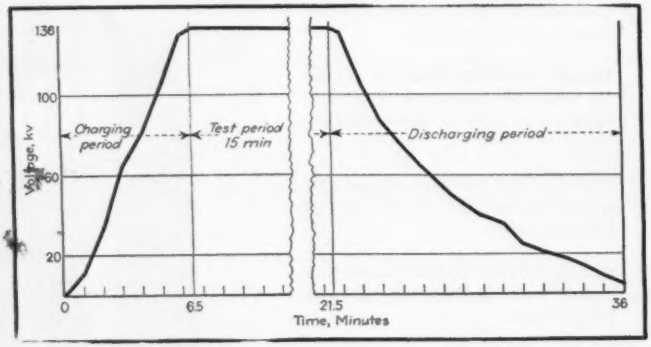
Final dc acceptance tests were made on a single 7.5-mile length of 25-kv submarine cable after it had been loaded on nine gondola cars for shipment to Bonneville Power Administration at Ranton, Wash. (EW, April 2, 1951, p 13 and April 30, 1951, p 13.) Standard dc test equipment was used with the addition of a measuring and discharge resistor connected between a short length of bus bar and ground. A length of high voltage x-ray cable was shunted across the ends of the cable to form a complete loop of copper to prevent electrical discontinuities during the tests, as shown in the lower illustration at right.

Conductors Tested Separately

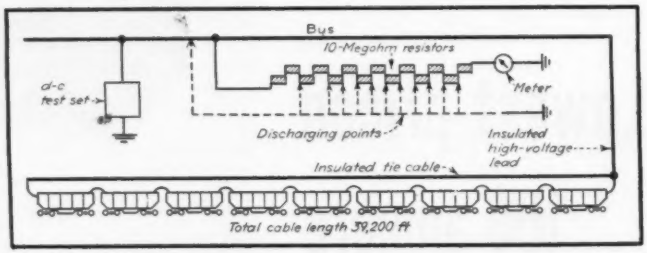
Each conductor of the 25-kv, 3-conductor, 300,000-cir mil cable was tested separately at 136 kv dc to ground. Voltage was applied at about 20 kv per minute up to full test voltage of 136 kv and then maintained at this level for 15 min. Then the ac supply for dc rectifier tubes was reduced to zero. The charge on the cable was allowed to leak off through the 140-megohm measuring resistor for about 4 min. Next, resistance of this measuring resistor was reduced by 10 megohms per minute for about 15 min. At the end of this period, voltage had fallen to 5 kv and a solid ground was connected to the bus bar. Relationship between voltage and time during the entire test on one conductor is plotted in the illustration at the top of the page.

At the end of the test, all conductors were left grounded for several hours to remove all traces of charge in the dielectric. Slow resistance discharge was used to prevent surges from taking place in the cable. It was thought that flashovers or too rapid a rise or discharge of voltage might set up travelling voltage waves which could produce voltages in excess of test voltage. The 39,200 ft of conductor had a capacitance of approximately 2.5 microfarads, which at 136 kv dc represents a great amount of stored energy.

Total current leakage observed on the equipment amounted to 1.3 ma. Approximately 0.9 ma flowed in the measuring resistance circuit and 0.4 ma flowed through the cable and across insulators and cable terminations. Even assuming that the 0.4 ma flowed in the cable alone, the increasing insulation resistance would be over 11,000 megohms per 1,000 ft or 11 megohms per ft.



TEST VOLTAGE was applied to and discharged from the 39,200-ft cable in small increments to prevent the formation of travelling voltage waves which might have produced voltages in the cable in excess of the test voltage of 136 kv dc to ground



TEST ARRANGEMENT for the cable as it lay in its nine railroad gondolas included an insulated tie cable to prevent electrical discontinuities during the test. Each conductor in the three-conductor cable was tested separately at 136 kv dc to ground

Primary Aluminum Capacity Of United States Producers
Present and projected

	Present Capacity*	Additions and New Smelters	Potential Economic Capacity	Reactivated Higher Cost Units	Maximum Capacity Planned
	(Millions of Pounds)				
Aluminum Co of America	739.5	240	979.5	158	1,137.5
Kaiser Aluminum & Chemical Corp	340	200	540	.....	540
Reynolds Metals Co	468	200	668	.....	668
Harvey Machine Co, Inc	.....	144	144	.....	144
Total, United States	**1,547.5**	**784**	**2,311.5**	**158**	**2,489.5**

Source: "Aluminum, the Industry and the Four North American Producers," courtesy The First Boston Corp.
* Based on capacities given in Judge Knox's opinion, United States vs Aluminum Co of America, dated June 2, 1950, plus additions through January, 1951.

Low joint resistance... high resistance to corrosion

POWER CONNECTORS

Silver plated on all contact surfaces!

Silver on all current-carrying surfaces is just one of the ways in which G-E power connectors reduce joint resistance and minimize corrosion. Carefully regulated copper content of connector alloy provides current-carrying ability equal to that of conductor. Sharp, machine-serrated contact surfaces bite into the conductor, giving a permanent high conductivity joint that resists vibration and maintains positive pressure at all times. Interlocking sides confine the strands of the cable within the enclosure, reducing inter-strand resistance and taking full advantage of the cable's current-carrying capacity. Non-corrodible hardware of high-strength bronze alloy assures permanent tightness of connections.

There's a wide range of types—straight, tee, block, angle, parallel, expansion, ground, and many others. Why not place a trial order with your G-E sales representative? Write for Bulletin GEC-400—it contains 44 pages of valuable connector information. Section 856-57, General Electric Company, Schenectady 5, N. Y.

856-57

GENERAL ELECTRIC

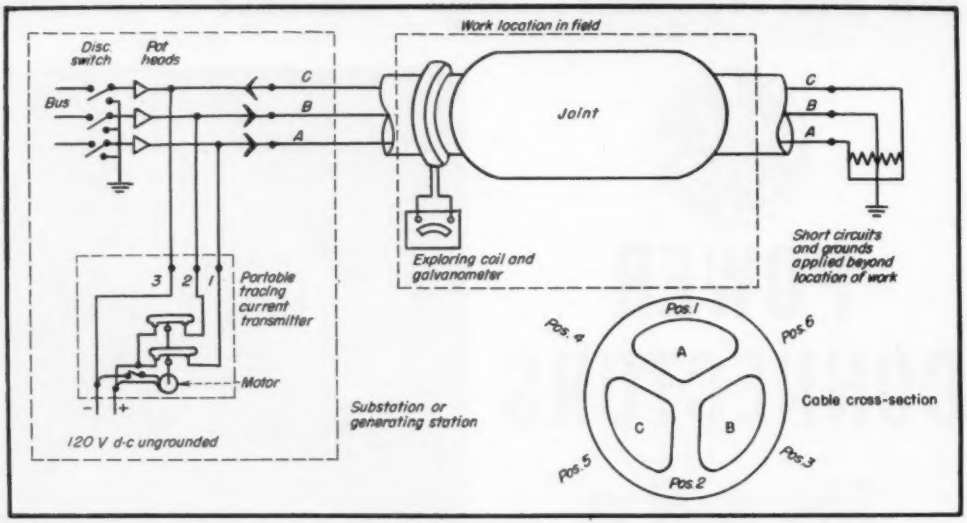


FIG 1—IDENTIFY CABLES and phases by "continual action" tracing current and exploring coil. Low-voltage current is generated by a motor-driven cam operating two mercury tube contactors. Exploring coil is applied to cable circumference

Identify Cables and Phases with Continual Current

F. B. KARGL
Supt., Field Operation Division
Substation Operation Dept
Consolidated Edison Co of New York, Inc

"Continual action" tracing current is used by Consolidated Edison Co to identify cables and phase conductors on 3-kv to 132-kv 3-phase circuits. The tracing current, a continuous series of different impulses (interrupted direct current), is on all three individual phase conductors continuously. Position of the phase conductor can be determined on the cable sheath or joint sleeve of a 3-conductor cable, provided the electrical direction of the tracing current is known.

In the application of this method, the cable remains connected to the transformer. After the cable is removed from service and de-energized, an initial ground is applied beyond the work location. A tracing current transmitter is connected to the three conductors at the station (Fig. 1). A continuous series of periodic tracing current impulses is sent over each conductor, 12 single positive impulses per min on "A" phase conductor; 12 double positive impulses per min on "B" phase conductors; and 36 negative impulses per min on "C" phase conductor (Fig 2). A polarized arc shaped exploring coil connected to a zero-centered galvanometer is used for the identification tests.

Cable identification is the first step. At the same time the phase conductor positions can be determined on sheath or joint sleeve of the 3-conductor cable. The exploring coil is moved in small steps on the cable circumference and the galvanometer deflections are observed at each point. Single periodic deflections are observed at two points on the cable, one when the center of the exploring coil is over "A" phase conductor (Fig 1, Pos 1), the other when the center of the coil is diametrically opposite "A" phase, or 180 deg around the cable (Pos 2). Double periodic deflections are observed at two points on the cable, one over the "B" phase conductor (Pos 3), the other opposite "B" phase (Pos 4). Likewise, continuous periodic deflections are observed at two points, one over the "C" phase conductor (Pos 5), the other opposite "C" phase (Pos 6).

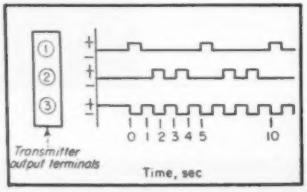


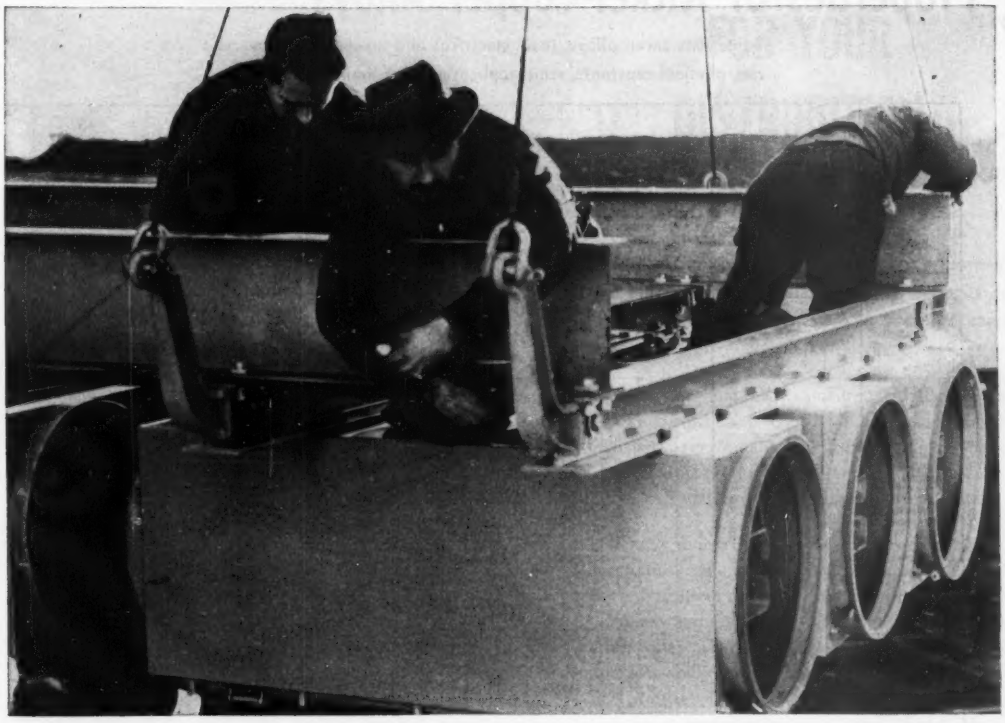
Fig 2—WAVE FORMS of "continual action" tracing current. Indications on zero-center galvanometer of these currents identify each of the phases

After the cable identification or phase identification test is completed certification tag is fastened to cable.

Cable identification and phase identification tests can be made at the same time on single-conductor cables. For the phase identification test it is not necessary to consider the direction of the tracing current source. When the exploring coil is placed on "A" phase conductor, a continuous series of single periodic deflections is observed; with the coil on "B" phase conductor, a continuous series of double periodic deflections is observed. When the coil is placed on "C" phase conductor a continuous series of periodic deflections is observed. Deflections on "C" phase conductor are the resultant of the combined impulses of "A" and "B" phase conductors.

An identification method using "directional impulse" tracing current was presented in "Electrical World," July 2, 1951, page 96. Another method using "individual action" tracing current will be in an ensuing issue.

Remove crate . . . Lift into place

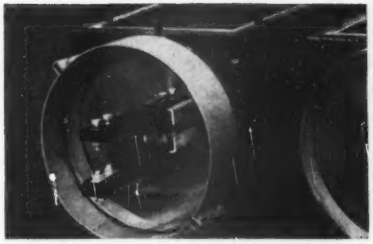


ISOLATED-PHASE BUS SECTIONS shipped assembled, ready to install

Factory-assembled G-E isolated-phase bus sections pay off in low installation costs. Crated three-phase sections arrive ready to lift into place. You simply knock sides off crate—apply lifting brackets to "H" mounting beams and hoist into position for permanent bolting. When bus connections are made with semi-flexible connectors and sectional joints are sealed with gasketed banding rings—the job is complete!

Other advantages of G-E design include high insulation values—reduced number of creepage surfaces without sacrifice of mechanical strength—dust and water-tight hinged covers which open from either side for easy inspection.

Your G-E sales representative has complete information. Ask him for a copy of GEA-5460, a 28-page publication that will aid you in planning your buses, or write to General Electric, Schenectady 5, N.Y.



Semi-flexible connectors join copper buses of adjacent sections. This provides quick and easy alignment between sections. Split gasketed aluminum banding rings seal out dust and water, reduce maintenance.

855-29

GENERAL ELECTRIC

Properties of Nickel-Copper Alloys

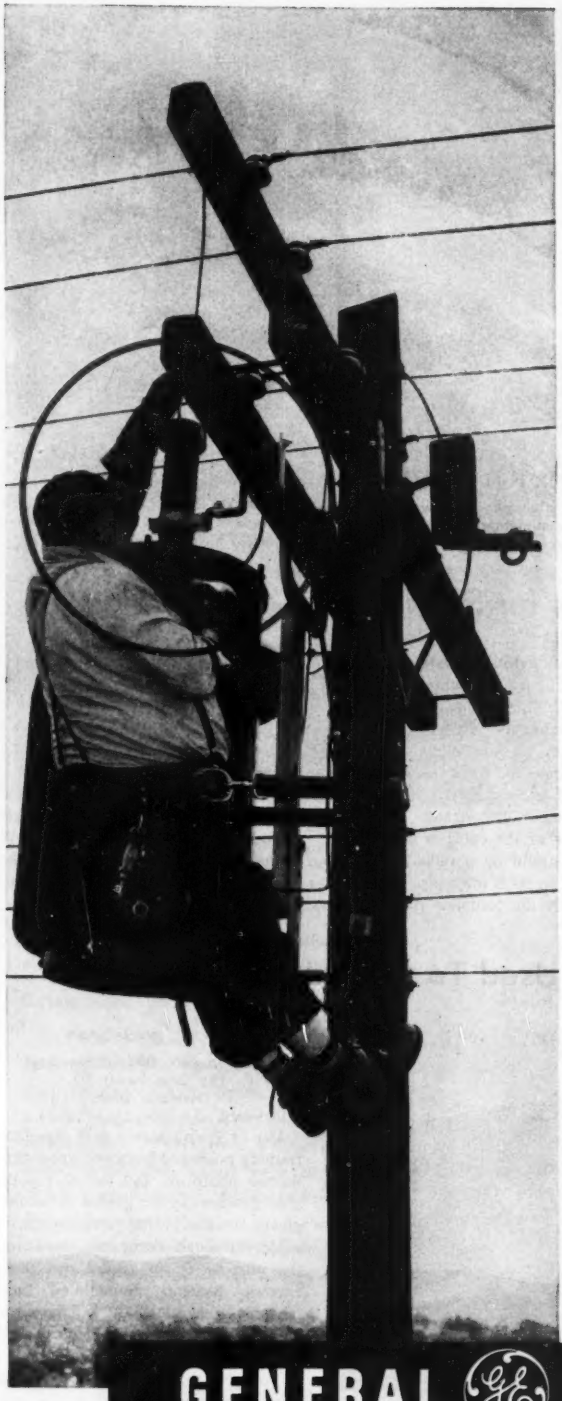
Table lists seven alloys, their electrical and mechanical properties, physical constants, some applications and limiting conditions

(EACH OF THE MONEL ALLOYS IS A REGISTERED TRADE NAME OF THE INTERNATIONAL NICKEL CO. INC.)

	ITEM	MONEL (APPROX ⅔ NICKEL, ⅓ COPPER) WROUGHT: ANNEALED[1]	HOT-FINISHED[1]	COLD-DRAWN ROD & BAR	COLD-ROLLED SHEET	COLD-ROLLED STRIP	TUBING (SEAMLESS DRAWN)	HOT-FINISHED PLATE	CAST	"326" MONEL — MONEL EXCEPT 50-61 % Ni	"S" MONEL (MONEL WITH ADDITION OF 0.35 % SULPHUR): HOT FINISHED ROD & BAR	COLD-DRAWN ROD & BAR	"K" MONEL (66 % NICKEL, 29 % COPPER, 2.75 % ALUMINUM): HOT FINISHED ROD & BAR[2]	HOT FINISHED ROD & BAR[2]	COLD-DRAWN ROD & BAR, SHEET & STRIP, TUBING & WIRE	COLD-DRAWN[2] ROD & BAR, SHEET & STRIP, TUBING & WIRE	"KR" MONEL: ANNEALED[2] ALSO AS-ROLLED[2] ROD & BAR	AS-ROLLED[2] ROD	AS-DRAWN[2] ROD & BAR	"S" MONEL Ni - 63 % Cu - 30 % Si - 4 % CAST	"H" MONEL Ni - 63 % Cu - 31 % Si - 3 % CAST
MECHANICAL PROPERTIES	YIELD STRENGTH (0.2 % OFFSET), 1,000 PSI	25-45	40-65	55-120	25-110	25-130	25-120	28-60	32-40	PHYSICAL AND ELECTRICAL PROPERTIES SLIGHTLY LOWER THAN THOSE OF MONEL IT IS NOT PRODUCED IN AS MANY FORMS AS MONEL AT PRESENT	35-60	50-100	40-110	100-125	70-100	90-130	40-60	90-110	70-130	60-80[4] 80-115[5] 80-115[6]	60-80
	TENSILE STRENGTH 1,000 PSI	70-85	80-95	85-125	70-120	70-140	70-125	70-90	65-90		75-90	85-115	90-135	140-170	100-135	130-170	90-110	130-150	100-170	80-100[4] 110-145[5] 110-145[6]	90-115
	ELONGATION IN 2 IN., %	50-35	45-30	35-17	50-2	50-2	50-10	50-30	45-25		45-25	35-15	45-13	30-20	35-13	30-15	45-35	30-20	35-15	4-2[4] 4-1[5] 4-1[6]	20-10
	HARDNESS, BRINELL	110-140	140-185	160-210	(3)	(3)	(3)	(3)	125-150		130-170	160-240	140-260	265-325	175-260	240-325	140-180	230-290	175-325	225-260[4] 275-350[5] 300-375[6]	175-250
AVERAGE PHYSICAL AND ELECTRICAL PROPERTIES	DENSITY, LB / CU IN	0.319									0.319		0.306				"KR" MONEL (MACHINABLE GRADE OF "K" MONEL) HAS ESSENTIALLY THE SAME PHYSICAL AND ELECTRICAL PROPERTIES AS "K" MONEL				0.302	0.305
	SPECIFIC GRAVITY	8.84									8.84		8.47							8.36	8.48
	MELTING POINT, DEG F	2370-2460									2370-2460		2400-2460							2300-2350	2350-2400
	SPECIFIC HEAT (32-212 F), BTU / LB / DEG F	0.13									0.13		0.13							0.13	0.13
	THERMAL EXPANSION COEF (32-212 F), 10^{-6} IN. / IN. / DEG F	7.8									7.8		7.8							6.8	6.8
	THERMAL CONDUCTIVITY (32-212 F), BTU / SQ FT / HR / DEG F / IN.	180									180		130							180	180
	ELECTRICAL RESISTIVITY (32 F), OHMS / CIR MIL FT	290[4]									290[4]		350							380	370
	ELECTRICAL RESISTIVITY COEF, TEMP. PER DEG F	0.0011									0.0011		0.000106								
	TENSILE MODULUS OF ELASTICITY, 10^{-6} PSI	26									26		26							21	20
	TORSIONAL MODULUS OF ELASTICITY, 10^{-6} PSI	9.5									9.5		9.5								
	POISSON'S RATIO	0.32									0.32		0.32								
	MAGNETIC TRANSFORMATION, DEG F	110-140								APPROX -8	110-140		BELOW -150				BELOW -150			BELOW -69	BELOW -69
	APPROX PERMEABILITY 68 F	VARIES WITH MINOR CHANGES IN ALLOY COMPOSITION							1.05+	1.025			1.0015							NON-MAGNETIC	NON-MAGNETIC
	PERMEABILITY 14 F								2.+	1.1			--								
SPECIAL APPLICATIONS AND LIMITING CONDITIONS	CORROSION RESISTANCE	WITHSTANDS ALL BUT A FEW OF THE CORROSIVES ENCOUNTERED IN INDUSTRY INCLUDING MOST ACIDS, ALKALIES, POLLUTED WATERS, FOOD PRODUCTS AND ATMOSPHERIC CONDITIONS																			
	SPRING PROPERTIES	SUITABLE FOR MODERATE STRESSES AT TEMPERATURES TO 400 F											SUITABLE FOR STRESSES SOMEWHAT HIGHER THAN MONEL AT TEMPERATURES TO 450 F								
	HEAT RESISTANCE	RETAINS HIGH STRENGH AT TEMPERATURES TO 800 F, OR HIGHER IN SOME INSTANCES NOTE:- AT SUBZERO TEMPERATURES, PHYSICAL PROPERTIES OF ALL THESE ALLOYS IMPROVE											HAS GOOD STRENGTH PROPERTIES TO ABOUT 1,100 F								
	USED TO AVOID GALLING																IN MODERATE CONDITIONS			YES	SLIGHTLY LESS THAN "S" MONEL
	LOW-SPARKING CHARACTERISTICS												YES							YES	

(1) BAR, ROD, PLATE, SHEET, STRIP, TUBING AND WIRE
(2) THERMALLY TREATED FOR MACHINABILITY
(3) CONSULT COMPANY'S INCO TECHNICAL BULLETIN T-5
(4) ANNEALED
(5) AS-CAST
(6) AGE-HARDENED
(7) FIGURES FOR THESE MILL FORMS VARY SOMEWHAT FROM WHAT IS SHOWN HERE. REFER TO INCO BULLETIN T-5

DATA FROM THE INTERNATIONAL NICKEL CO, INC



THE BEST PROTECTION FOR YOUR DISTRIBUTION SYSTEM

35 million arrester-years *haven't* been wrong! G-E Pellet Arresters hold lightning voltages to lower levels—more consistently over the years—than any other distribution arrester.

Year after year, General Electric Pellet Arresters have continued to provide a combination of low sparkover and low IR drop that holds lightning voltages on the transformer to safer values—safer than with any other distribution arrester.

What's more, these unexcelled protective characteristics remain practically unchanged with time. Dry inert nitrogen (N_2) fills the sealed gap-chamber and prevents the formation of ozones and oxides. Gap electrodes stay bright as new, and low sparkover characteristics are stabilized. Sealed-in-nitrogen construction is *exclusive* with G-E Pellet Arresters.

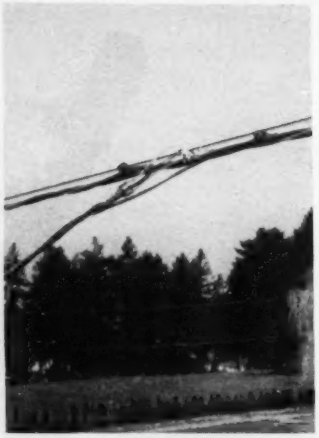
The pellets, of lead dioxide, are actually formed with water in a tumbling barrel. Providing valve action with exceptionally low IR drop, they are unaffected by atmospheric moisture, condensation or humidity.

These features mean the best in protection—achieved through 35 million arrester-years of operational experience. This pellet arrester service record is unapproached by any other distribution arrester.

Don't gamble when you buy protection—insist on G-E Pellet Arresters for your distribution system. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

NOT AERIAL CABLE but two insulated stranded aluminum conductors loosely spiralled around a third provide these services with a minimum of eye interference. Portland General Electric also uses this type cable for secondaries



MID-SPAN TAPS using an automatic dead-end for the bare neutral supporting conductor have proven successful

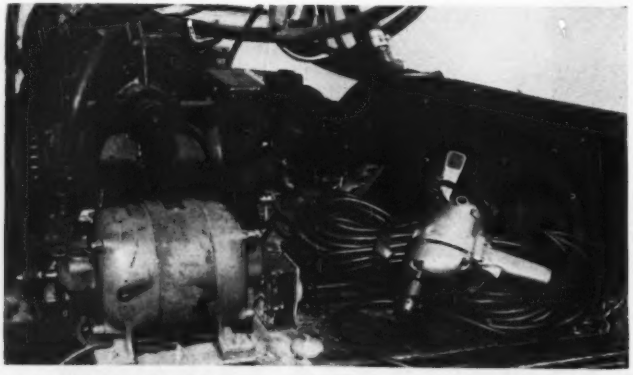
Spiralled Conductors for Services and Secondaries

Spiralled aluminum cable has been used for services and is now being tried for distribution secondary circuits by Portland General Electric Co. Advantages, which are obtained for little or no premium compared to conventional three conductor construction, include neater appearance, better weathering properties, and lower maintenance.

Cable is made of two neoprene or polyethylene insulated stranded aluminum conductors loosely spiralled around a bare all-aluminum neutral conductor. Service lengths of three No. 4 conductors (No. 6 copper equivalent) are self-supporting. For secondary spans the three No. 2 conductors used are supported by a ⅜-in. high strength guy strand. The bare conductor of the cable is attached to the guy strand by parallel clamps at about 12 to 20 ft intervals.

Recently the company has successfully tried mid-span tapping of secondary circuits, taking services off directly opposite the point of delivery at the customer's house. The bare conductor is supported by an automatic deadend looped around the messenger, as shown. At the building end the bare neutral is anchored with a single screw knob, requiring less space and giving a better appearance than the three attachments which are conventionally used.

Improvised Generator Used To Operate Portable Drills



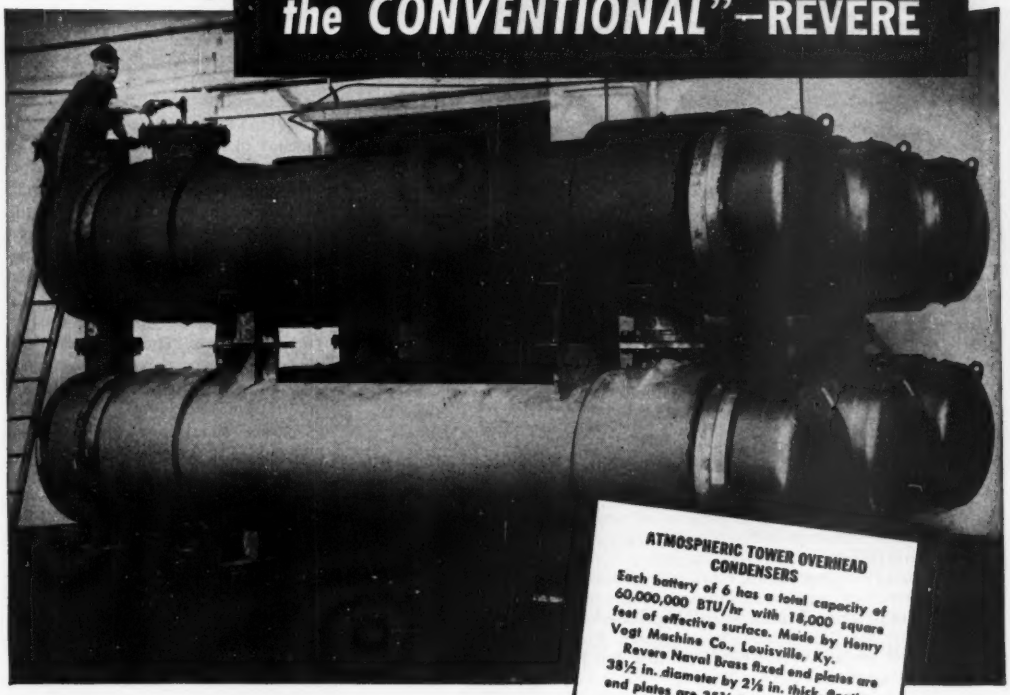
IMPROVISED GENERATOR, a converted motor, is mounted at right angles to and lower than the power take-off chain of the motor-driven hoist

A. T. HOLMQUIST
Line Foreman, Distribution Dept
The Ohio Power Co
Newark, Ohio

Use of ½-in. electric drill expedites framing poles and installing line-transformer platforms, but use of a portable gasoline-driven generator as the power source is not always practicable, although many are used for this purpose on the American Gas & Electric System. Sometimes such portable generators do not provide enough power and the electric drill may stall.

To solve this problem, a salvaged 1-hp compound wound dc-motor was mounted behind the cab of a semi-

"Even *the UNUSUAL* can include *the CONVENTIONAL*"—REVERE



ATMOSPHERIC TOWER OVERHEAD CONDENSERS

Each battery of 6 has a total capacity of 60,000,000 BTU/hr with 18,000 square feet of effective surface. Made by Henry Vogt Machine Co., Louisville, Ky. Revere Naval Brass fixed end plates are 38½ in. diameter by 2⅛ in. thick, floating end plates are 35¾ in. diameter by 2 in.

These Henry Vogt Machine Co. condensers have an unusual feature: vapor belts in the shells to feed more copious and uniform flows of vapor than are obtained by the usual single nozzles.

Inside the condensers, the tubes are rolled into Revere Naval Brass Tube Sheets.

The use of Revere Naval Brass for this purpose is completely conventional in condenser building practice. Revere Naval Brass is corrosion resistant, strong, tough, durable. Every mechanic on the production line knows how to fabricate it. Every maintenance man knows how to treat it when doing a servicing job. Thousands of Revere Naval Brass plates are in daily use in condensers and other heat exchangers built by all the best manufacturers. Some of these plates have been in service for decades.

Revere has alloys for your unusual design features too. Some of these are conventional, made to do unusual jobs because the Revere Technical Advisory Service knows where and when to recommend them. Others are less well known.

When you work out an unusual design you want to concentrate your attention on the unusual features. Under those conditions, use the time tested, service proven, utterly dependable standard Revere alloys in the standard parts of your design and you will be able to forget those parts and keep your attention where it is needed.

For any problem at all that involves the use of metals, consult the Revere Technical Advisors. Their knowledge, skill, experience, contacts (yes, we ask questions as well as answer them) can add up to money in the bank for you.

REVERE 150 YEARS OF SERVICE TO AMERICA

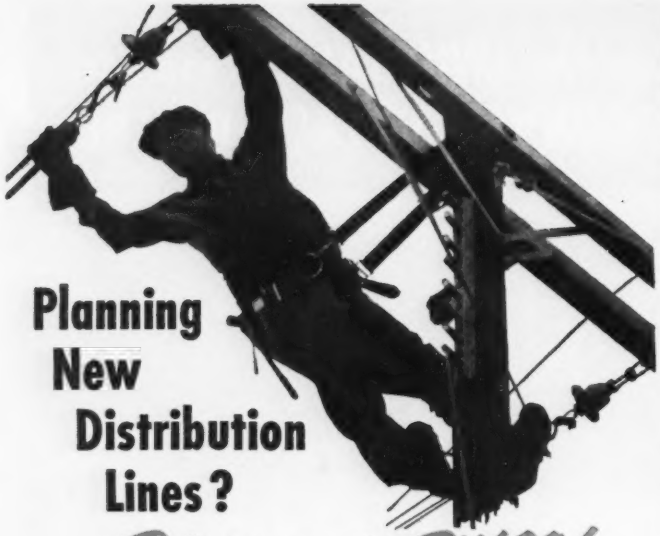
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



Planning New Distribution Lines?

Put it up to PINCO!

Putting up a Distribution Line is no problem when you "Put it up to Pinco" . . . because Pinco has everything you need—Insulators . . . Line Hardware . . . Guy Strains. Pinco makes them all, and they're all "tops" in performance as thousands of miles of such lines can prove. Engineered and built to distribution line requirements, Pinco products are not only RIGHT *for* the Job but RIGHT *on* the Job . . . for You!

Refer to Pinco Catalog No. 49 for complete electrical and mechanical characteristics.

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.

Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain.

tractor line truck in such a position that it could be connected to the motor driving a hoist and used as a generator. The mounting is indicated in the illustration. The large hexagon head bolt in the power take-off hub was replaced with a substitute hexagonal piece which extends approximately 2½ in. beyond the shaft end and serves as the drivefit mount for a 10-in. expansible-hub pulley. Attached to the shaft of the dc unit is a 2¼-in. V-pulley which is driven through a V-belt from the hoist motor.

Connected across the unit circuit is a flexible cable leading to a toggle switch and an inexpensive voltmeter on the cab dashboard. The toggle switch is included to prevent the voltmeter burning out when the hoist is normally used. The voltmeter indicates the generator voltage and may also be used to indicate the speed of the hoist motor.

Power outlet from the converted dc unit is a condulet with weatherproof receptacle to which the cord plug of a ½-in. portable drill may be attached. Latter has 500 ft of rubber-covered cord so that the customary line-transformer platform or pole to be framed is within range of the power outlet. A sheet-metal cover encloses the motor, belt, and pulleys, protecting the assembly from inclement weather. This cover is bolted to the tractor frame.

While operating the hoist motor at idling speed, a minimum of 120 v dc is generated; increasing the speed will permit a maximum of 250 v. These power drilling facilities have cut the time for installing platforms and framing poles over 50%. The outfit has been used by line crews for several months with satisfaction. To extend its usefulness, plans are being made to utilize it for emergency maintenance illumination.

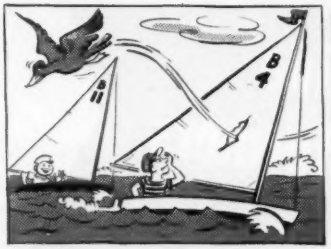
Transfer Saves Building Temporary Structure

T. M. BLAKESLEE

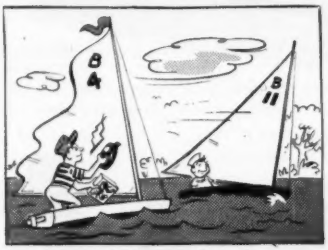
Engineer of Transmission
Los Angeles Dept. of Water and Power

Construction of a new transmission tower by the Los Angeles Department of Water and Power, rather than disassembly and relocation of an existing tower which had to be

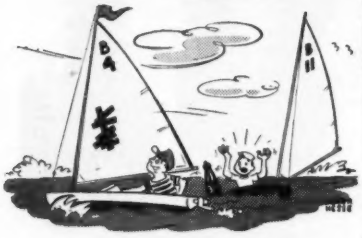
(*Continued on page* 132)



You can do a lot



with a little



GOLD SEAL TAPE

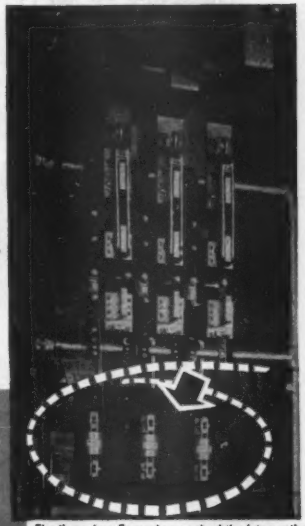
You save time and money with Gold Seal Tape . . . there's no waste, full footage is guaranteed. Lasting "tack" from end to end — makes tighter longer-lasting joints. Buy it, try it! In 10-roll containers, or in single rolls. Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.

JENKINS

Gold Seal Tape

FRICTION and RUBBER TAPES
MADE BY JENKINS BROS.
MAKERS OF FAMOUS JENKINS VALVES

how to trap amperes and save circuits....



The three Amp-Traps shown raised the interrupting capacity of this 1600 amp circuit to 100,000 rms amperes @ 440 volts.

SHAWMUT
Amp-trap®

AMAZING NEW CURRENT LIMITER

100,000 rms AMPERES INTERRUPTING CAPACITY

TWO-WAY PROTECTION

Amp-trap protects against *both* overloads and shorts on circuits up to 600V AC or DC. It is supplied in all standard ratings from 1 to 4,000 amps, and limits short circuit current on circuits where the available short circuit current may be as high as 200,000 amps.

STOPS SHORT CIRCUITS SHORT

Amp-trap puts a dependable new protective device in the hands of designers, engineers and architects. Lightning fast, it is directly responsive to the *rate of short circuit current rise.* In fact, *it is as fast as the circuit is fast.* This means positive overload and short circuit protection for switchgear, bussducts, motor starters, circuit breakers, and current transformers. What's more, with Amp-trap, you can now have low-cost protection for every service entrance on a network system.

APPROVALS

Amp-trap is listed by Underwriters Laboratories. Interrupting tests up to 202,000 amps at 500 Volts 60 cycles have been witnessed and certified by Electrical Testing Laboratories, Inc.

FOR OLD OR NEW SYSTEMS

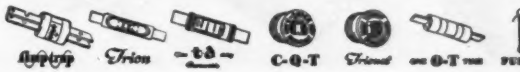
There is an Amp-trap for every application. They are easily installed and quickly adapted to new or old equipment. Cost is so low that it is not an important factor.

WRITE TODAY. SEND FOR FREE BOOKLET ON AMP-TRAP.

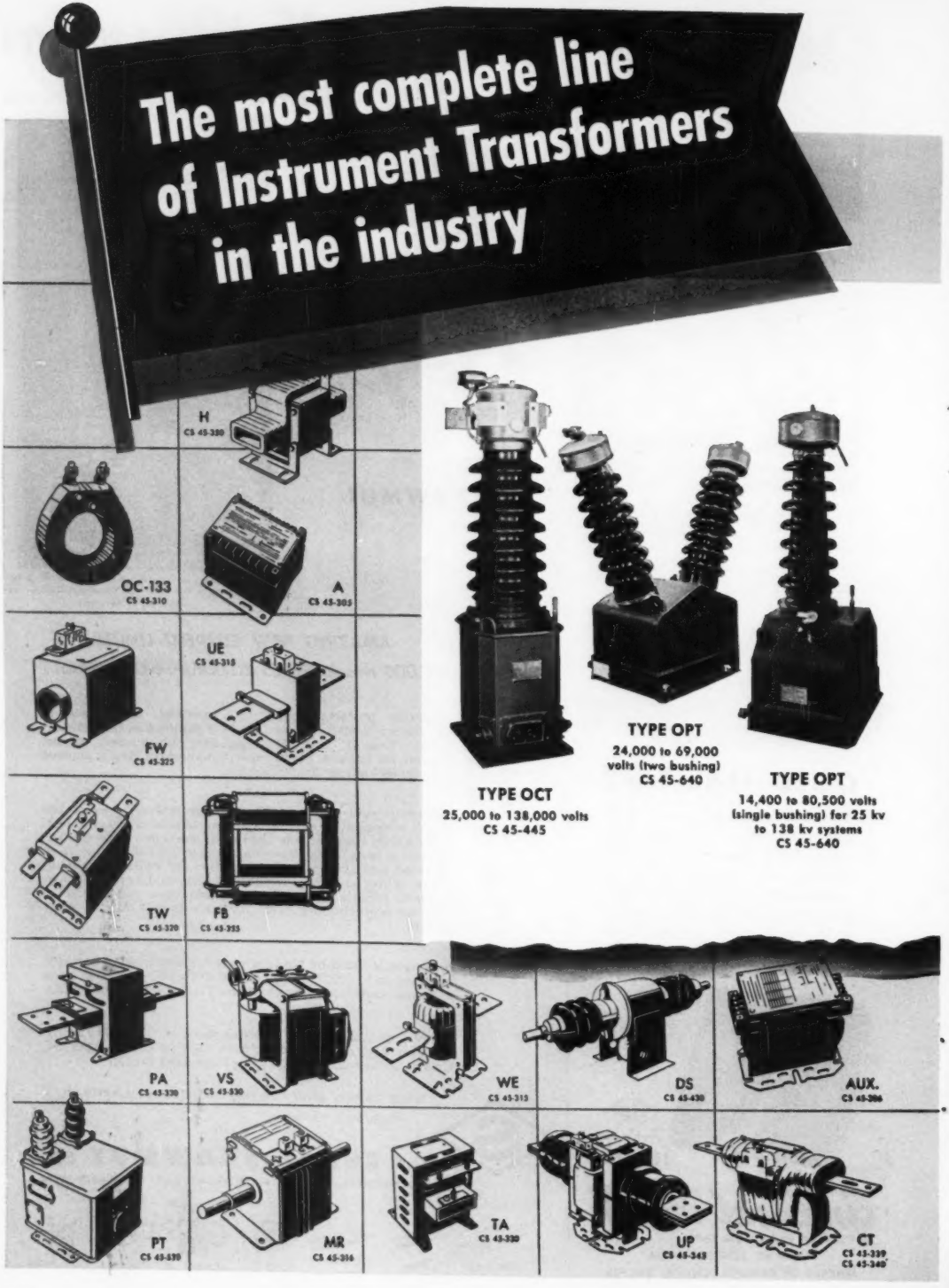
*Trade Mark Registered.

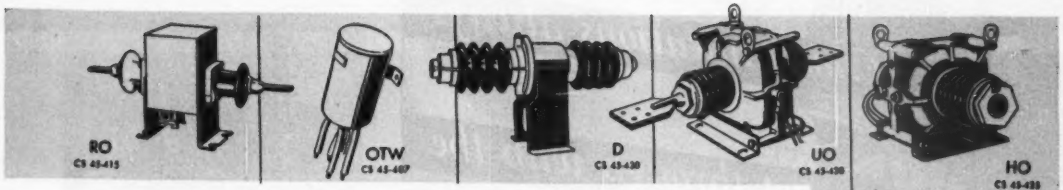
(You can get Amp-trap)

THE CHASE-SHAWMUT CO.
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS



The most complete line of Instrument Transformers in the industry





Specific answers for specific needs!

The complete line of Westinghouse Instrument Transformers contains a type and rating for every requirement.

For example, if you have a problem in accurate metering on a 69-kv line averaging 800 amps, the Westinghouse Types OCT-69 for current, OPT-69 (single or two bushing) for voltage, are designed to supply meters rated 5 amps and 115 volts.

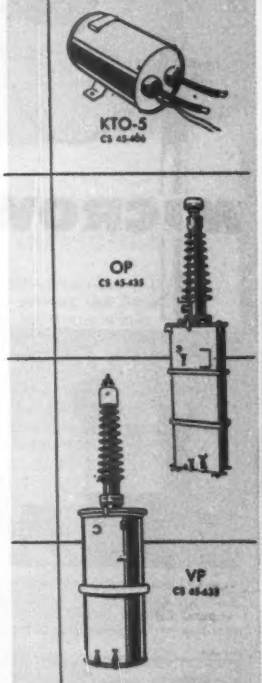
The Types OCT and OPT have been designed especially for outdoor service. They are oil filled, have improved weather-shed bushings and have an element-resisting finish on metal surfaces. They are built to conform to the highest accuracy standards established by ASA. Similar types are available for a wide range of ratings.

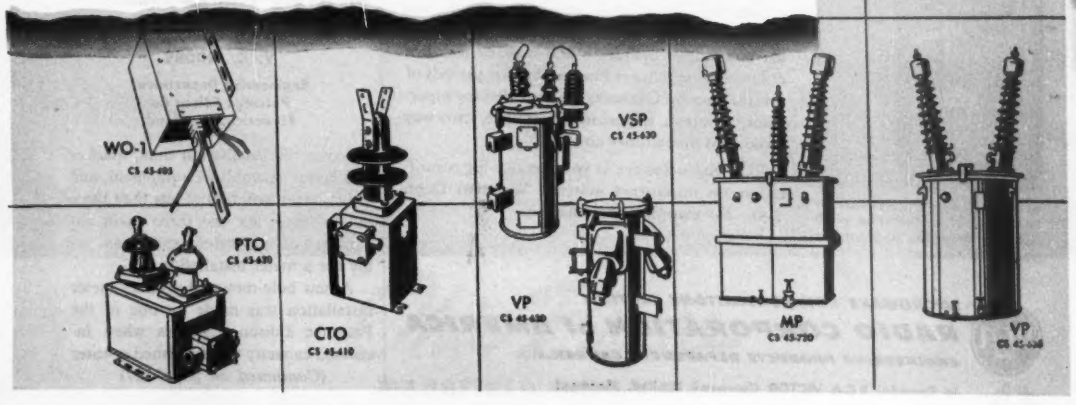
Others cover metering, relaying, indicating and auxiliary applications. For complete information on any of the types listed, ask your Westinghouse representative for a copy of the catalog identified by the "CS" number under each illustration; or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70589

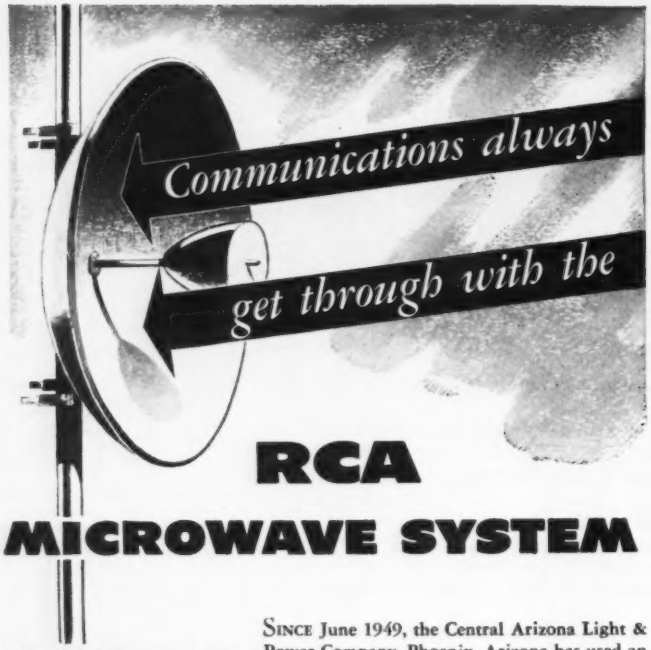
YOU CAN BE SURE... IF IT'S

Westinghouse

INSTRUMENT TRANSFORMERS

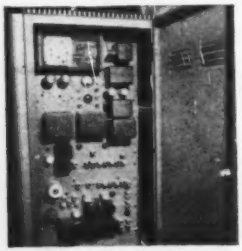






RCA MICROWAVE SYSTEM

Two links of receiving and transmitting antennas of Central Arizona Light & Power Co., located on roof of generating plant.



RCA Microwave Transmitter-Receiver. The generating plant and each switching station has a transmitter-receiver.

SINCE June 1949, the Central Arizona Light & Power Company, Phoenix, Arizona has used an RCA Microwave System for remote control of switchgear . . . telemetering of voltage, current and power . . . two-way voice communication —between a generating plant and two remote switching stations.

Despite severe lightning storms, temperatures of 140 F, unusual exposure to wind, sand, dust, and insects, RCA Microwave equipment has provided excellent continuity of service.

Reliable Performance, Lower Costs

This modern system of communication costs less per mile to construct and operate than conventional wire or carrier current systems. Parabolic antennas focus transmitted signals to span distances up to 35 miles. Repeater stations provide a path for signals over mountains, rivers and rolling countryside. The equipment is designed for unattended operation and may be installed at locations which are inaccessible for periods of several months. Channels are provided for supervisory control, teleprinter, facsimile, two-way radio, and many other circuits.

RCA engineers are at your service for consultation on microwave systems. Write to Dept. 5-31 for complete information.

MICROWAVE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.
In Canada: RCA VICTOR Company Limited, Montreal

Transfer Saves

(*Continued from page* 128)

SUBSTITUTION instead of relocation of the existing tower saved about $22,000 when street widening required a change of 60 feet in the location of this tower

moved, saved an estimated $22,000 during widening of a street in Los Angeles. Location of the tower in question, a double-circuit structure carrying Hoover power into the city, had to be changed by some 60 feet. A four-degree angle in the line complicated the problem.

Disassembly and reassembly of the tower plus construction of a temporary support for the line in the interim period would have cost an estimated $35,000. Instead, a new tower was partially erected on the new location with the line still energized. The line was de-energized, the tower completed, and the line transferred. Then the old tower was disassembled. Approximate cost of the entire relocating operation was $13,000.

Metering Transformers Pole-mounted as Unit

V. C. MOORE
Engineering Department
Potomac Edison Co
Frederick, Maryland

Saving of installation time, quicker and better assembly of equipment, and a service interruption of less than three hours—these are the three main advantages of a transformer unit-assembly for a meter installation.

A new pole-mounted primary meter installation was made on one of the Potomac Edison Co lines when increased capacity was furnished a water

(*Continued on page* 137)

HI-TENSION NEWS *Junior*

If You Can Match this for Toughness... You'd Better Match it for Insulation!

Nothing comes easily on this power line--the 350-circuit-mile, 150-kv transmission loop of Forces Motrices Bernoises serving the Swiss Alpine region. High altitudes, indescribable terrain, hurricane winds, massive ice, impassible snow, add up to an operator's nightmare. Yet service continuity on this line is exceptionally high, measured against *any* standard . . . When, for months at a time, men can't even reach portions of the lines to patrol them, let alone repair them, every piece of material must be carefully chosen and critically watched. It is significant, therefore, that O-B suspension insulators are used throughout -- significant to you who may also have a tough job to hand to insulation.

Ohio Brass

MANSFIELD, OHIO, U. S. A.

OB

HI-TENSION NEWS *Junior*

A Simple Matter of Safety

● In working an insulator "hot," the danger zone is described by the largest area in which line potential can exist or, in other words, by the moving end of a tie wire while being wrapped. This is roughly a four-foot circle around the conductor.

When an O-B Clamptop insulator is substituted in this picture, the danger zone shrinks to the mere dimension of the small clamping head since there are no tie wires or other extending charged elements. With the same safety clearance in both cases, men on the pole are much farther from danger when they work Clamptops. In addition, most of the work is done with a simple socket wrench and the finished job is stronger, more permanent, and all-around better than even the best tie.

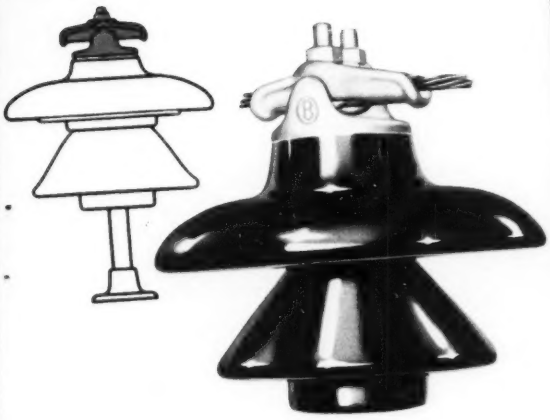
If for no other reason than added safety--and there are plenty of other reasons--investigate the O-B Clamptop.

The ONE Variable Left-

"What are its dimensions--what is its electrical rating--what are its wet leakage and dry arcing distances--what are its dry and wet flashovers--what is its strength" . . . all these questions and many more are covered in standard specifications of the station insulator you plan to buy

But, the big question is this: "How long will it give satisfactory service?". Standards don't cover this subject; first, because it can't be described or defined; second, because durability is the one variable left in a station insulator.

While you're buying a highly standardized product in a station insulator today, don't forget they've *never* standardized the quality that has made O-B insulation the time-and-time-again choice of critical users for the past 35 years. The only way you can specify this is to specify O-B!

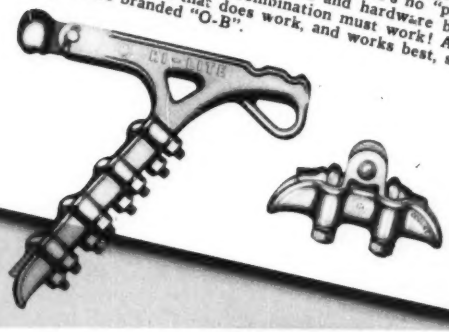


The Finest Combination

Measured from low basic averages, protective tolerances of the O-B Thorex lightning arrester are *less than* +10 per cent sparkover and *less than* +5 per cent IR discharge voltages. Tolerances such as these are radically low, providing they apply to a correspondingly low average. When you *get* this combination, you have unmatched protection for station apparatus . . . This is what the O-B Thorex offers you: low average ratings and *extremely low tolerances*--a combination that deserves your most critical examination before specifying your next arrester installation.

Made by an INSULATOR Manufacturer

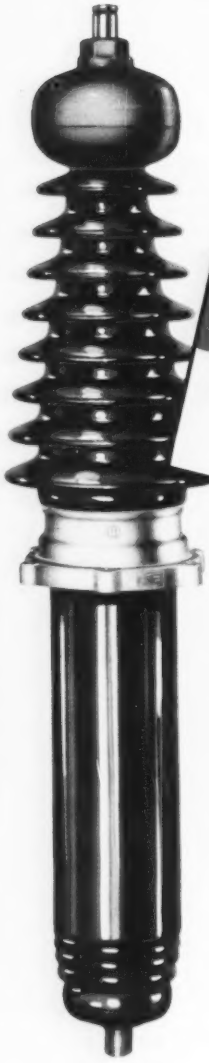
Support of a high voltage conductor is a joint responsibility, shared equally by the suspension insulator string and the cable clamp. In the entire electrical industry, O-B is the only supplier whose insulators and hardware are designed by the same men, made in the same factory, accepted as a single responsibility. Men working together produce parts that work together . . . There's no "passing the buck" when both insulators and hardware bear the same trade mark--the combination must work! And for the combination that does work, and works best, see that both are branded "O-B".

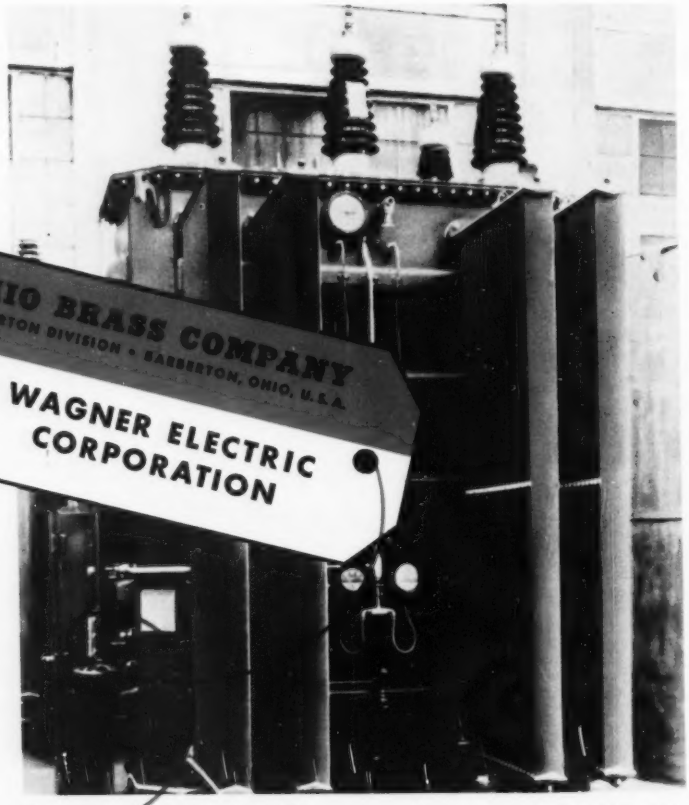


Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*





One of three recently-built Wagner transformers rated at 69,000-4,160 Y volts, 5,000/6,667 kva, 3-phase, 60-cycle which, according to the manufacturer, includes such features as . . . "Automatic regulating inert gas oil preservation system, no-load tap changer for floor level operation, flanged wheel trucks, magnetic oil level gauge, hot oil and hot spot dial indicator, and all standard Wagner accessories. Another important piece of equipment on this transformer are . . ."

O-B Bushings One of the Finest Components of ANY Transformer

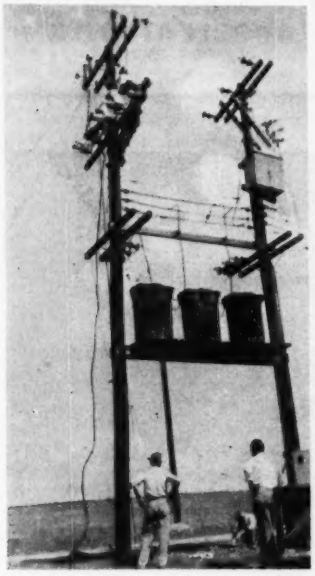
Ohio Brass

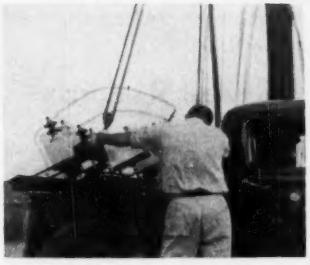
MANSFIELD, OHIO, U.S.A.

4132-H

Metering Transformers

(*Continued from page* 132)





TRANSFORMERS for metering service were assembled as a unit in meter shop, (bottom) trucked to location, then hoisted, (top) secured to pole, and connected to 12-kv 3-phase, 4-wire circuit

pumping station. The transformer pre-assembly consisted of three 7,200-v, 60:1 ratio potential transformers and three 15:5 ampere current transformers mounted on crossarms. Previously the two kinds of transformers were mounted as separate units.

The equipment was assembled in the Frederick meter shop and trucked to the location. Here the complete unit was hoisted to a height of 35 ft and secured to the pole.

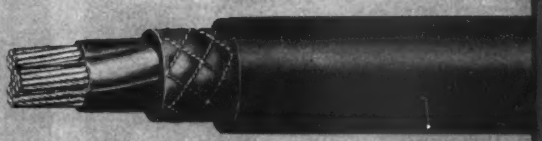
Mounting and connection time was 2½ hours. As interruption to customers' service was limited to three hours, the pre-assembly resulted in the deadline being met with time to spare.

• MAXIMUM PROTECTION AND LONG LIFE •

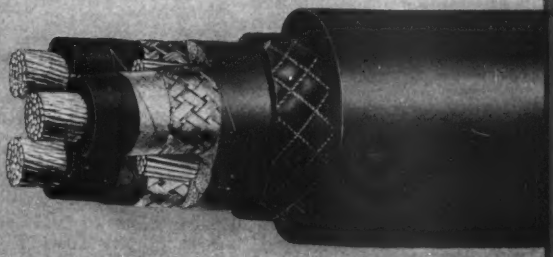
CRESCENT

IMPERIAL NEOPRENE

Portable Cords and Cables



TYPE W-600 VOLT CABLE
For use with heavy duty, portable equipment



TYPE SH-D 5000 VOLT TRAILING CABLE
For supplying power
to electric shovels, dredges, etc.

CRESCENT
WIRE AND CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

BEFORE infrared lamp bank was used to heat vinyl record material prior to pressing, this steam table method caused material to stick to the table, making handling much more difficult

AFTER infrared bank installations, record material is heated to proper working temperatures (295F) without sticking to tables. Temperature is more uniform and losses are reduced

Infrared Aids Handling and Improves Quality of Records

F. C. NEAL
Power Engineer
Cincinnati Gas & Electric Co
Cincinnati, Ohio

An infrared lamp installation has solved a difficult heating problem. Vinyl records are heated (before pressing) by infrared to provide more uniform heat, cut losses, and eliminate the sticking of records to the table tops experienced with formerly-used steam table method at King Records, Inc, Cincinnati, Ohio. The vinyl material is now heated on 175F table and a bank of twelve 250w infrared lamps is mounted 12 in. above table top providing 290-295F at a point 2 in. above table top. In 5 min material reaches the proper working temperature without sticking to the table. Total load of seven tables (four for 45rpm and three for 78rpm records) in use is 21kw, operating 8 hr daily, 5 days a week. Pairs of 120-v infrared lamps are connected in series and the load is balanced on 240 v, three-phase.

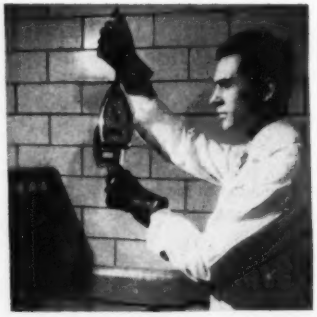
New Plating Method Conserves Nickel

Here's a simple new method of metal plating that may conserve critical nickel and still provide new automobiles and appliances with bright, corrosion-resistant trim.

The technique—called periodic reverse-current plating—is said to be applied easily to auto bumpers, door handles, radiator grilles, body trim, toasters, irons, and tubular furniture.

Where no nickel at all is permitted, such as on appliances and auto trim, the new process provides a chrome-on-copper finish that is claimed to be as bright as the standard finish and to have satisfactory corrosion resistance.

In other cases, where some nickel is permitted—auto bumpers, for example—this plating process is said to make it possible to substitute copper for a major part of the nickel normally used, thus saving this critical



NO-NICKEL PLATING METHOD for appliances and auto trim provides a chrome-on-copper finish, which is claimed to be as smooth and as bright as the standard finish and to have satisfactory corrosion resistance

material for defense production.

This method developed by Westinghouse Electric Corp, has been used by them for more than a year to electroplate appliances. Now several automobile manufacturers and suppliers are adopting it for use on many types of auto parts and accessories.

A layer of copper—about one-thousandth of an inch thick—is plated onto the steel base. If nickel is allowed, a layer about one-half the thickness of the copper layer is added. The coating is completed with a film of chrome that may be less than 1/100,000th of an inch thick. Before nickel was put on the critical list, the conventional method was to plate the steel first with nickel and then chrome.

The key feature of the new plating system, is the periodic reversal of short duration of the plating current. This alternately deposits metal on the surface to be plated, then during the reversal, takes some of it away. Continuation of this cycle builds up a plate quality which is claimed to be superior to anything previously obtained from straight, un-reversed direct current. In effect, this system is said to make it possible both to improve surface smoothness and brightness, and to enhance the body quality of the deposit.

In the copper plating process the piece to be plated is placed in a bath containing copper in a cyanide solution. When electric current is passed through this bath, copper is deposited on the metal piece—which forms the negative terminal of the system—and dissolved into the bath from a copper electrode which is the positive plate.

Then, after less than a minute, the current is reversed. As a result, some of the copper already plated on the metal part is dissolved. This cycle is repeated until a satisfactory finish is achieved. Each time the current is reversed, inferior metal deposits are removed from the surface and succeeding layers are always plated on sound metal thus producing a superior finish.

PORTABLE INFRARED DRYER saves several hours on each touch-up lacquer drying job. "Blushing" is eliminated and finish is more uniform and has more luster

Portable Dryer Speeds Drying Time

Paint drying of touch-up lacquer work is speeded with a portable infrared lamp dryer at Harvey Golden, Inc., Reading, Pa. This dryer is especially advantageous during damp weather, since only 15 to 20 min is required for touch-up drying which otherwise would take 3-5 hr. In addition, all "blushing" of the lacquer is eliminated by this method. The finish produced is more uniform and has more luster than with normal air drying. The dryer is also handy for drying out automobile door panels where moisture has collected. This job is quickly accomplished without damage to fabric or covers. Dryer has six 250w infrared lamps.

INDUSTRIAL BRIEFS

Electric Panelbox Condensation Drying was solved at Union Terminal Cold Storage Co, Elizabeth, N. J. by installing an electric strip heater in the wiring gutter of each of 21 panelboxes. In addition the back of each box was painted with red lead followed by a waterproof finish. After several years operation all heated boxes are still good as new while one unheated and unpainted box actually fell apart (from rust) within a few months. The insulating plastic in the unheated panelboxes develops heavy condensation and electrical paths which eventually short circuit. Heaters are 20-w each and are turned "on" 24 hr daily. Frank Marino, Chief Electrician, Union Terminal Cold Storage Co.

D-C power is supplied quickly and economically to punch-press motor at the Westinghouse Beaver, Pa., plant from a truss-mounted 3-hp selenium rectifier plugged into adjacent bus duct. Small total load from scattered d-c machine tools does not require m-g sets and distribution feeders.

Motor Drive relocation in the Thomson Drop Forge Co plant in Plantsville, Conn., cut power bills about 20%. Machines were shifted to more compact groups; roller and ball bearings replaced sleeve bearings on all shafting; reductions were made in shafting and belting; and over-motoring was greatly decreased. Efficiency of motor operation was raised.

Yarn testing accuracy and speed is increased at the research laboratories of Pacific Mills, Lawrence, Mass., by a new photoelectric recorder and other electronic devices which they combined with their yarn testing equipment. A permanent record of evenness and weight of yarn of every known fiber, both natural and manmade, is provided at rate of 12 yd per min. Actual fiber weight is recorded, exclusive of moisture and oil content, and without previous conditioning in standard atmosphere rooms. Old trial and error methods have been eliminated. G. E. Co.

Personalized Selling Boosts Model Kitchen Acceptance

N. H. BARNES
Potomac Electric Power Co
Washington, D. C.

DEALERS' SALESMEN get product instruction in Electric Institute demonstration room. Salesmen establish confidence by performing various services for customers

In 1950, in the service area of the Potomac Electric Power Co, 60% of new houses built on contract for owner's occupancy, and 26% of those erected by speculative builders included electric kitchens. In 1949, and 1948 also, the respective ratios were 49% and 12%. The upping of these ratios from the levels of previous years, plus the fact that 40% of the speculative houses started, but not completed, in 1950 also included electric kitchens, was the reason for PEPCO's receiving a Hughes Award at the EEI 1950 sales conference. In 1949, less than one fifth of new homes built in the company's territory had electric kitchens; the proportion of new homes with electric kitchens was nearly a third in 1950.

This accomplishment was the result of cooperation between all elements of the local electrical industry, headed up in the Electric Institute of Washington. At the hub of the wheel of cooperation are the 21 district representatives of the sales department of the power company. Each of these experienced men has an assigned territory in which he handles residential customer business. About half of their time is taken up by bill inquiries, rate matters, and arrangements for line extensions and service connections to customers' homes.

Salesmen Become Well Known

These and other customer services make the salesman well known, give them standing and prestige, among the people in their territories. They are therefore well equipped to promote electricity in the home and because of the large volume of new home building much of their effort is exerted in this field, although not to the neglect of existing customers.

Effective allies of the district representatives are the sales personnel of distributors and dealers who work hand in hand with them.

The district representatives have at their call the services of other groups in the sales department in planning and engineering installations. Among the activities that add up to forceful promotion of electric kitchens are the following:

1. Personal contacts of the district representatives with architects, builders, and owners of homes. By following up leads from builders, architects, and others, many times before the homes are planned, they get in early in the development of home-building ideas.

2. Assignment of district representatives to cover electric kitchens in model homes when they are advertised and open to the public.

3. Promotion of the idea by dealers' and distributors' salesmen in their daily contacts.

4. Distribution of the magazine, "Electricity in Building."

5. Kitchen planning, lighting, and adequate wiring services, including comprehensive layouts personalized with names and addresses of the prospects.

6. Home service demonstrations to groups of all kinds and sizes, even to wife and husband in private consultations.

7. Showing and explaining features of appliances on the display floor of the Electric Institute.

8. Group meetings in the Playhouse of the Electric Institute.

9. Teaching kitchen planning to school classes and other young women groups.

10. Power company participation in annual show of the Washington Home Builders Association.

11. Advertising in daily and weekly newspapers, in building trades magazines, on a daily radio program, and on enclosures with electric bills.

Keep Operating Costs down with "HIPERCORE"

Keep operating costs down by reducing transformer outages. Savings obtained by economical system planning and efficient operation can be wiped out quickly by a higher-than-average transformer mortality rate.

It takes more than high electrical efficiency or low exciting current, or low impedance to make a transformer economical. It takes built-in ruggedness with ability to withstand severe overloads, lightning surges and intermittent secondary faults. It takes *balanced design* . . . no one feature exploited at the expense of another. The chain is no stronger than its weakest link.

For low overall cost over a period of years, specify Moloney HiperCore Distribution Transformers.

Improved Short-Time Overload Capacity

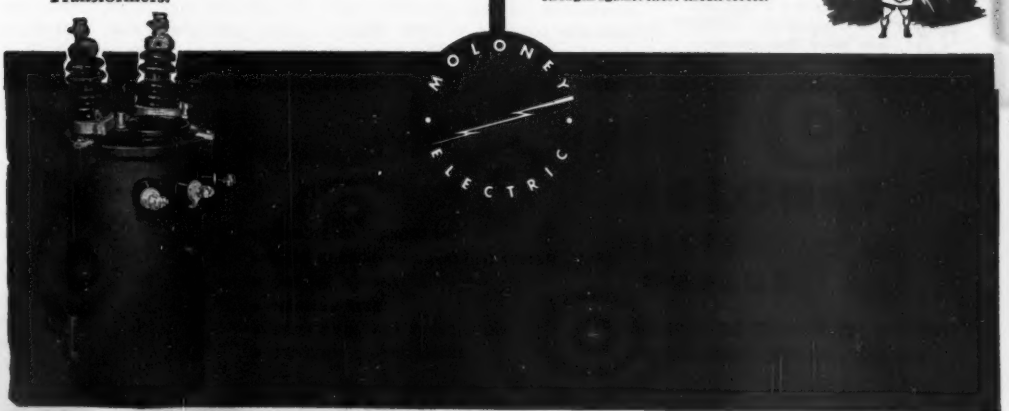
Improved short-time overload characteristics provide better peak load performance and longer life. Reduced coil mass, achieved through use of oriented steel cores together with the extensive use of cooling ducts, results in more rapid cooling of windings and lower hottest-spot temperature gradient.

High Surge Resistance

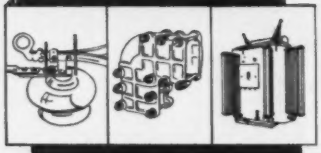
Moloney HiperCore Transformers are designed to withstand lightning surges well in excess of the minimum requirements. A high factor of safety in properly distributed insulation and vacuum processing produce the ultimate in overall dielectric strength.

Greater Mechanical Strength Against Short Circuit Forces

Coils are made mechanically rigid through the use of heat curing bonding material. The coils are blocked solidly by the impregnated core which is in turn banded with tons of force, providing maximum strength against short circuit forces.



ABSOLUTE SECURITY for BOLTED ASSEMBLIES



PALNUT
TRADEMARK
LOCK NUTS

Apply a PALNUT Lock Nut on top of each ordinary nut you install and forget about loose bolts, assemblies and connections. Cost is negligible—application takes but seconds—protects for the life of installation. No further checking or re-tightening are needed. Perfect conductivity is assured.

PALNUT double-locking spring action prevents nut from loosening and bolt from backing out. May be removed and re-used. Full range of sizes, in plain, Parkerized and Hot Dip Galvanized steel; also silicon bronze.

Samples and literature on request

The PALNUT Co.

Planned Lighting Improves Floodlighting

STANDING OUT in the sky at Youngstown, Ohio, is the tower of the Home Savings and Loan Co building. At night it is a landmark, but a much more striking one than it was before Ohio Edison's Bob Zimmerman convinced the Home Savings management that Planned Lighting could greatly increase the tower's effectiveness as an advertisement. That it did is attested by these two pictures. Large flashing signs catch the eye. The white marble of the tower is flooded with color from capped PAR lamps. The translucent clock faces are easily readable with 96-in. Slimlines behind them. And shining brilliantly through each of the small windows at the top are 3-kw mercury lamps. The total connected load exceeds 45 kw. Now no uplifted eye can miss seeing this tower, a Youngstown landmark

Campaign Sells Commercial Cooking

WM. P. McPHERSON
Commercial Sales Manager
Carolina Power & Light Co,
Raleigh, N. C.

An average of nearly 2.2 kw of new load in 3500 food service establishments on the lines of the Carolina Power & Light Co was the result of commercial cooking promotion that won the company a 1950 Hughes Award in that activity. This was done against active LP and manufactured gas competition in a rural territory of 22,000 sq mi and 295 towns, half of which have populations under 1,000.

Total new cooking load amounted to 7,956 kw in 223 separate sales, as shown in the table.

This result was attained by 8 full-time commercial and 12 combination salesmen working under 3 supervisors. Their efforts were backed up by full mobilization of dealers and by the competent work of local service organizations in maintaining equipment in good condition.

Training of company salesmen included the EEI basic sales course and the 2-day Hotpoint commercial cooking course, study of EEI data sheets, monthly sales clinics, and on-the-job training, including preparation of sales proposals. Sales aids included free trial offers, a complete list of installations classified by types of business, pictures of outstanding jobs, testimonials from users, and newspaper and direct mail advertising. Direct mail was comprised of "Food Service News," "Today's Business," "Fact Book of Commercial Cooking

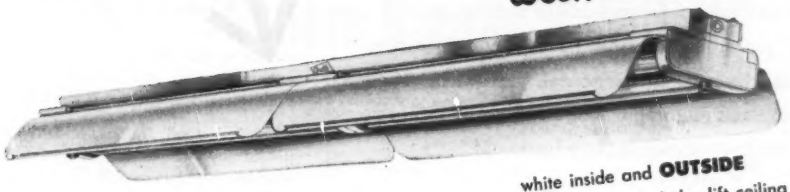
Total New Cooking Load

57 Restaurants	1,271 kw
47 Schools	1,479 kw
23 Institutions	1,029 kw
24 Churches	568 kw
28 Drive-ins	530 kw
17 Clubs	477 kw
9 Hotels	376 kw
18 Other	657 kw
Additions to existing units	1,569 kw
Total	**7,956 kw**

a new idea in factory lighting as different as white from black

it's all
Polar Bear White
for better sight
and better light

GUTH WYTE-LINER
with AIRFLOW channel

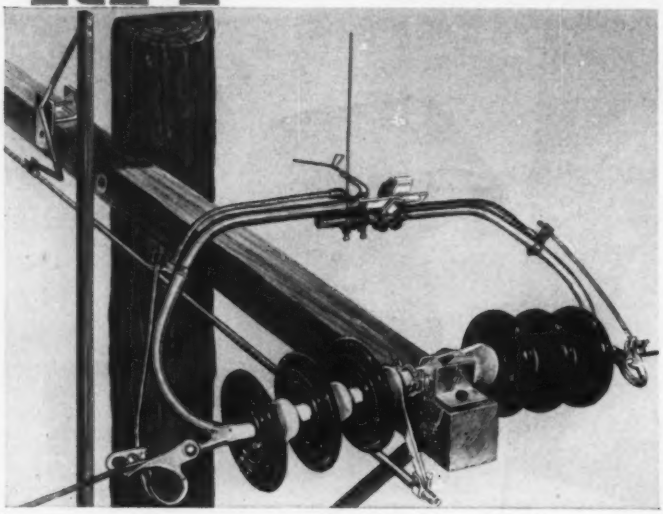


white inside and **OUTSIDE**
the white upside helps lift ceiling gloom
result: reduces strong shadows and harsh contrasts—no more gloomy "black-top" ceiling effects—improved brightness-contrast ratios—easier on the eye
surface 300° Permalux or Porcelain Enamel Airflow Channel circulates air for longer ballast life
easy to clean
easy to install
Wyte-Liners are made in 2 and 3 conventional 40-watt light units, also for 4- and 8-ft. Slimline lamps

may we send you our 16-page Wyte-Liner catalog 48-H with detailed information?

Guth LIGHTING
THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI
Leaders in Lighting since 1902

KPF POLE TOP SWITCHES



Simple design means more switch ...for less money!

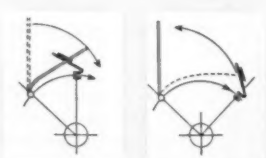
KPF Pole Top Switches cost less because they are simplest in design. They lower installation costs because they bolt on a single crossarm in minutes, require no extra insulators. KPF switches save, too, on upkeep; simple push-pull interphase rods never bind because of crossarm warpage; monel and bronze bearings never need lubrication.

KPF switches may be used in horizontal, vertical or triangular mounting. Free floating, self aligning blades and jaws maintain proper contact under all conditions of switch sag adjustment.

NEW QUICK-BREAK ATTACHMENT FOR KPF SWITCHES

The split-second breaking speed of these new KPF attachments means you can switch many circuits without using expensive circuit breakers. Attachment is available for all KPF switches rated 15 to 69 kv.

WRITE FOR DETAILS



Spring rod winds to full tension as switch opens.

Rod springs clear, breaking contact at high speed.

KPF ELECTRIC COMPANY
855 Howard Street • San Francisco 3, Calif.

Equipment," "What One Cent Will Do," "Electrified Profits," and an electric fry chart.

Every effort was made to cooperate with architects, engineers, and contractors by supplying layouts of equipment and wiring, and advising on types of equipment. Close working relationships with dealers were made by giving them sales leads, by assistance in closing sales, and by displays of equipment in company offices.

The company sponsored the Hotpoint "Restaurant Round-Up" in the fall of 1950 with excellent results. All heavy-duty and most of the counter equipment used in the demonstrations were sold at the end of the show.

Sales and Service Notes

• A new manual outlining six basic plans for operating a successful trade-in business is being offered to dealers by Hotpoint, Inc. The 24-page manual, entitled "Trade For Profit," points out the historic part trade-ins have in the appliance business and outlines a specific program for dealers to follow in handling this business. A list of reference books for use in appraising used appliances is included in the manual, together with an analysis of economic factors affecting the resale of second hand merchandise. Check lists of parts for all appliances which may require reconditioning or replacement and an accounting system to determine cost of such reconditioning are included in the handbook to guide dealers in making appraisals. It also contains advice on establishing a certified guarantee program and specific instructions on advertising used appliances.

• Of 753 fatal traffic accidents reported by 48 cities of large and medium population, 482 or 64% occurred after dark, according to the National Street and Traffic Safety Bureau. Of the total 140,833 accidents reported, only 41% were at night. These two ratios say that the proportion of night time fatal accidents is much higher than that of daytime. Indicating how this proportion can be lessened, the Bureau offers the record of fatal accident reduction resulting from improvement of lighting on streets in 18 cities. In 11 of the cities the improvement eliminated night fatalities entirely in the areas lighted. The least reduction reported among the remaining 7 was 62%.

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB

She Keeps 'em Rolling without stops to unravel loose ends. She's using *Polyken* Tape No. 163.

Square D pulls a switch!

That would hardly be big news up in Milwaukee, where Square D makes switches as well as about everything else electrical.

But this switch they pulled is of a different sort.

In wrapping DC magnetic starter coils, they were using ordinary friction tape. This tape collected dirt, was too thick, and did not have the desired tack and adhesion.

But the main objection to friction tape was the fact that the edges unraveled. This meant complete work stoppage until these ravelings could be removed.

They found that they can run through a whole roll of *Polyken* No. 163 Tape without stopping to unravel the edges. This meant many costly hours saved on the production line.

Actually, *Polyken* No. 163 performed better in all respects. Unlike friction tape, which is tacky on both sides and sticks best to itself, No. 163 is a pressure-sensitive adhesive tape that sticks to any clean, dry surface—and its outer backing, which is free from adhesive material, will not collect dirt or grime.

You are probably using friction tape in your plant or shop. *Polyken* No. 163 is suggested for practically every application where friction tape is used. Underwriters' Laboratories will approve the tape on any electric device or apparatus in place of ordinary friction tape.

FREE SAMPLES. Write today for complete specifications and engineering data, plus samples of *Polyken* No. 163. Address *Polyken*, Dept. EWG, 222 West Adams Street, Chicago 6, Illinois.

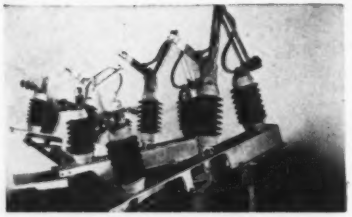
***Polyken* Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

ICE PROBLEMS? Read This...

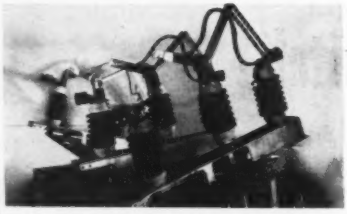
This Chance three phase type WN Switch, with standard controls, was coated in the closed position with over ¾" of hard, clear (bubble-free), ice made with distilled water slowly sprinkled on the switch at various angles to simulate the most severe conditions.

No other switch offers so many operating advantages

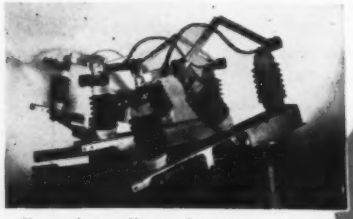
CHANCE WN-VN



"Torture rack" tests proved that performance of the Chance Type WN Switch is not affected by any conceivable warpage of cross-arms. Note side of base is cut away to show control operation.



Note that each switch unit is closing independently of the others. Standard controls were used and no extra leverage was applied. Switch operated easily in spite of the most extreme distortion.



The exclusive Chance Compensator Control mechanism brings all three blades of the switch into completely closed position. No switch or control adjustments were required to compensate for this extreme distortion.

You get top performance under all conditions plus many time, money, and labor saving features when you buy the new Chance WN or VN Gang Operated Switches.

You save on installation because the flanged bases are easy to mount on cross-arms and the interphase shaft can be laid in position after the switch units are mounted—no threading of the shaft is required.

You get dependable operation under all conditions of climate or stress. The exclusive Compensator Control mechanism is housed under the switch base, protected from the weather. This control operates each switch unit independently so that each blade in a three pole switch makes complete contact regardless of warping, twisting, settling or bowing of the wood supporting structure.

A new "crow-bar action" blade, plus the *extra leverage* of the weather protected Compensator Control, makes Chance WN or VN Switches your best buy for performance under heavy ice.

Maintenance time is negligible with WN or VN Switches because all bearings are lifetime lubricated, the flanged bases don't cut into the wood supports and loosen the bolts, and the switch performs properly regardless of structural warpage.

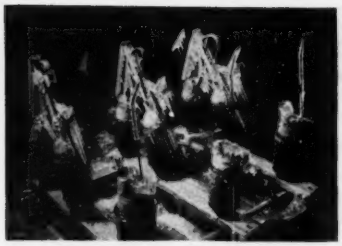
The Compensator Control prevents shock to the insulators and damage to the switch blade in closing, because the closing action is reversed when the control goes through toggle on each individual switch unit. *Slamming the switch closed will not break insulators.* Heavy castings and extra rugged construction also mean long service life without maintenance.

For reliable switching under all conditions, plus time saving installation advantages, specify Chance Type WN or VN Switches. Write for complete information and prices.

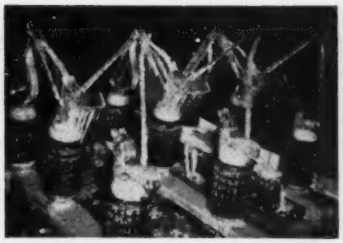
Current ratings 200, 400, 600 amps.,
Voltage ratings 7.5, 15, 23, 34.5 and 46 kv.

Warped Cross-arms don't affect WN or VN

You know



Various tests were made at temperatures from 20° F. above zero to 16° F. below zero. After 12 hours of sprinkling, hard blows with a hammer only chipped the ice, leaving a white mark. Yet, one man at the controls opened the 3 phase switch without difficulty.

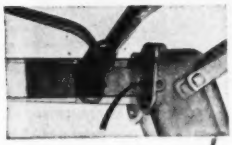


The switch was cleaned and iced again in the fully open position, under the same conditions, with over ¾" of ice on all moving parts of the switch and controls. Operator (background) has started the closing movement.

With standard controls one man closed the three phase switch completely with four chopping blows of the blade. There was no damage to the switch in either of these tests and performance was completely satisfactory

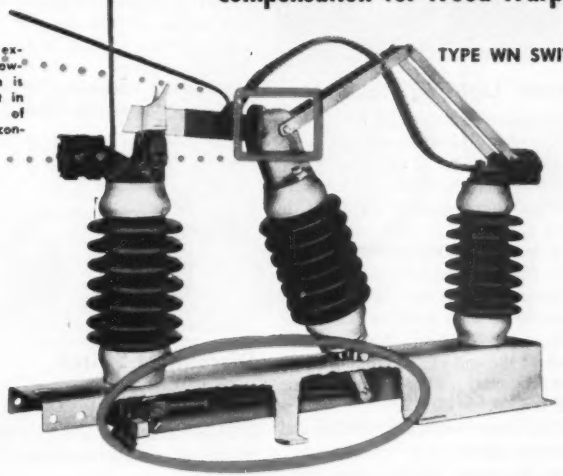
SWITCHES

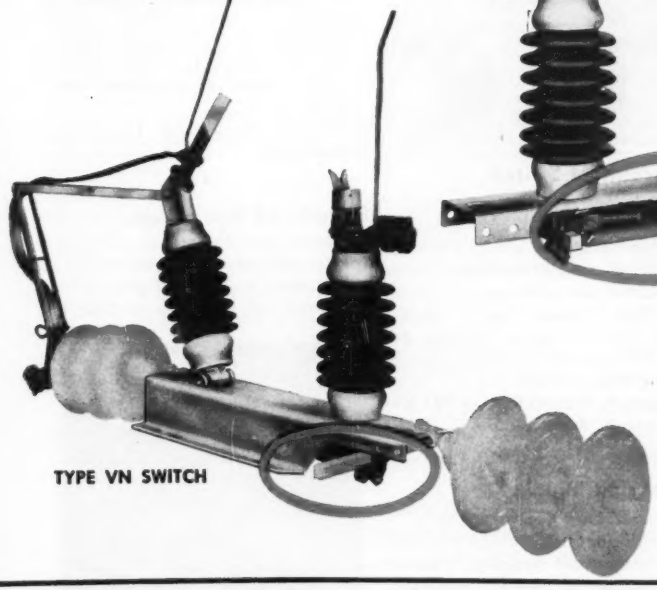
- New Ease of Installation
- Crow-bar Leverage for Ice
- Compensation for Wood Warpage



Double exposure shows exclusive ice breaking "crow-bar action." Pivot pin is forced up against slot in blade — prying rear of blade up ⅜" before contact end is lifted.

TYPE WN SWITCH





TYPE VN SWITCH

COMPENSATOR CONTROL MECHANISM

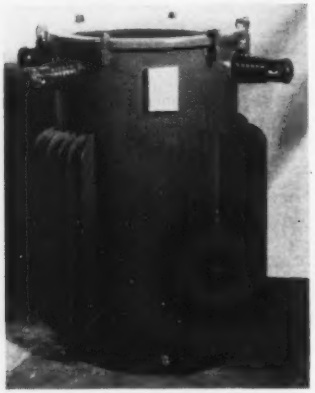
Cutaway sections of the flanged mounting base show the weather protected Compensator Control that eliminates closing shock and gives *extra leverage* for smooth, easy operation. This mechanism operates each switch unit independently of the others to give positive, uniform blade contact on all phases. Effect of distortion on the control shaft is negligible, as each blade in a three pole switch arrangement makes complete contact without affecting either of the other two blades.

it's RIGHT when you specify CHANCE

A. B. CHANCE COMPANY **CENTRALIA, MO., SAN FRANCISCO, CALIF.**

C50-22

NEW EQUIPMENT



Street Lighting Regulator

Available in ratings of 5 to 30-kw with 6.6 or 20-ampere secondary currents, a new line of constant-current regulators have a 2400-v primary connection that operates on 2280 to 2520 v.

A special 2160-v primary tap provides for operation on 2050 to 2270 v.

Horizontal tank-type bushings allow insertion of leads from two directions and a non-breakable hand-operated knob at the end of the bushing eliminates the need for tools when making connections.

Units have built-in protective and switching devices.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

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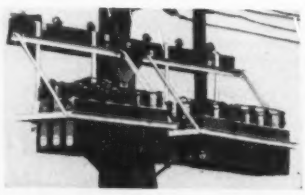


Capacitor Bank

A broad selection of open rack capacitor assemblies completely fabricated at the factory has been announced. These units require only connection of the high voltage leads to the switch terminals, and the interconnection of the control wiring from the control to a terminal box which is included with each rack.

Racks are available both switched and unswitched, in voltages from 2,400 to 13,000, and kva ratings of 225 to 300.

Line Material Co, Milwaukee, Wis.

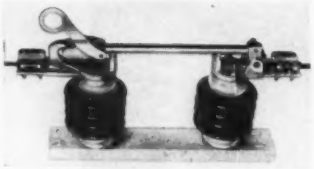
•

Wood Preservative

Pol-Nu, a wood preservative in paste form is now being formulated for special applications. Containing 5% pentachlorophenol by weight this product has a consistency of ordinary cup grease. It will cling to vertical wood surfaces and can be forced into checks and joints.

Chapman Chemical Co, Dermon Building, Memphis 3, Tenn.

•



Disconnect Switch

High contact pressures reported for this new single pole, single throw disconnect switch are obtained through the use of a toggle mechanism which eliminates contact springs.

Switch is rated 7,500 to 69,000 volts, 400 to 600 amps. Separate arcing areas provide protection against pitting main contacts.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.

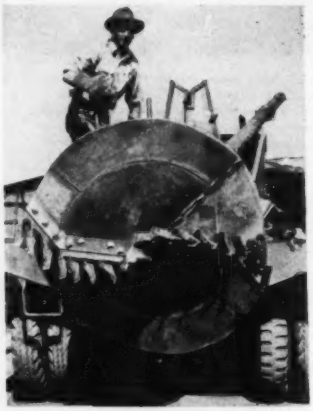
•

Stringing Blocks

Rubber lined sheave groove of a new stringing block provides a cushion for cables while stringing, reducing the possibility of damage from sheave.

Blocks are furnished with cast aluminum sheaves and are equipped with Oilite Bearings.

Distribution and Hi-Line Specialties Co, 2100 Del Norte, St. Louis, Mo.



Earth Auger

Three larger sizes of the Pengo twin-helix earth auger for use in heavy duty earth-boring machines are now in production.

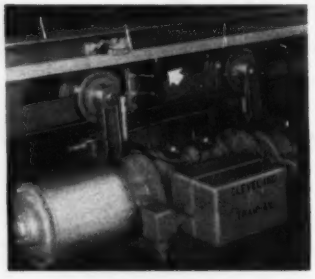
Diameters are 42, 48, and 54 in. Units are designed for use in all popular makes of earth-boring machines.

Petersen Engineering Co, Santa Clara, Calif.

•

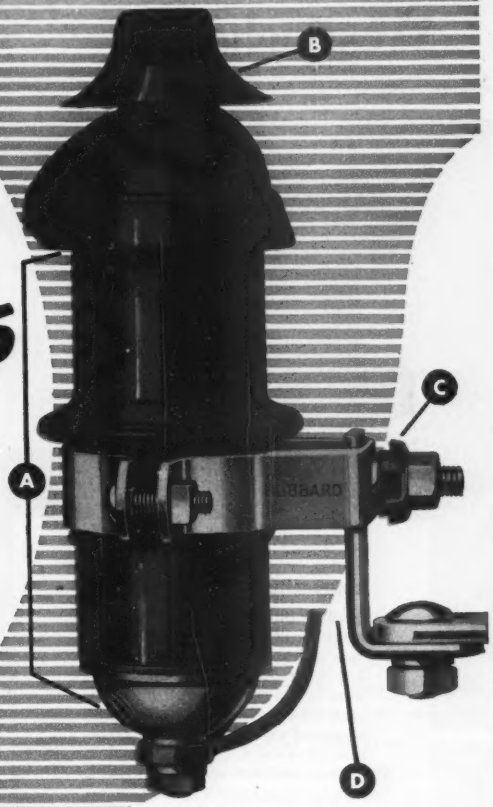
Overhead Equipment

Injuries resulting from accidental contact with power bars used for overhead cranes and tramrail systems are prevented with a new type of electrification especially designed to provide maximum safety.



Saf-Powr-Bar consists of an inverted U-shaped conductor, enclosed in an insulating plastic cover, inside

ALL THE AUTOGAP ADVANTAGES *plus* LINE TERMINAL INSULATION



HUBBARD Line Insulated Autogap Lightning Arresters are the answer for utilities who do not approve of exposed hot line terminals. When lines are worked hot, exposed terminals present a constant hazard, especially on congested poles. The insulated line terminal also prevents bird trouble.

Electrically, these insulated Autogaps have the same characteristics as other Hubbard Vertical Autogap Arresters. Salient points are indicated in the illustration. The line terminal at the top of the arrester is protected by a bakelite cap.

The external gap is between the arcing horn and the "Y"-shaped extension of the grounded mounting bracket.

Standard EEI-NEMA mounting brackets are supplied—No. 2337 for Crossarm mounting or No. 2338 for Pole mounting.

A *TWIN EXHAUST an exclusive Autogap feature, assuring maximum surge capacity.*

B *Bakelite insulator cap covering line terminal.*

C *Ground terminal attachment.*

D *Air gap.*

HUBBARD AND COMPANY

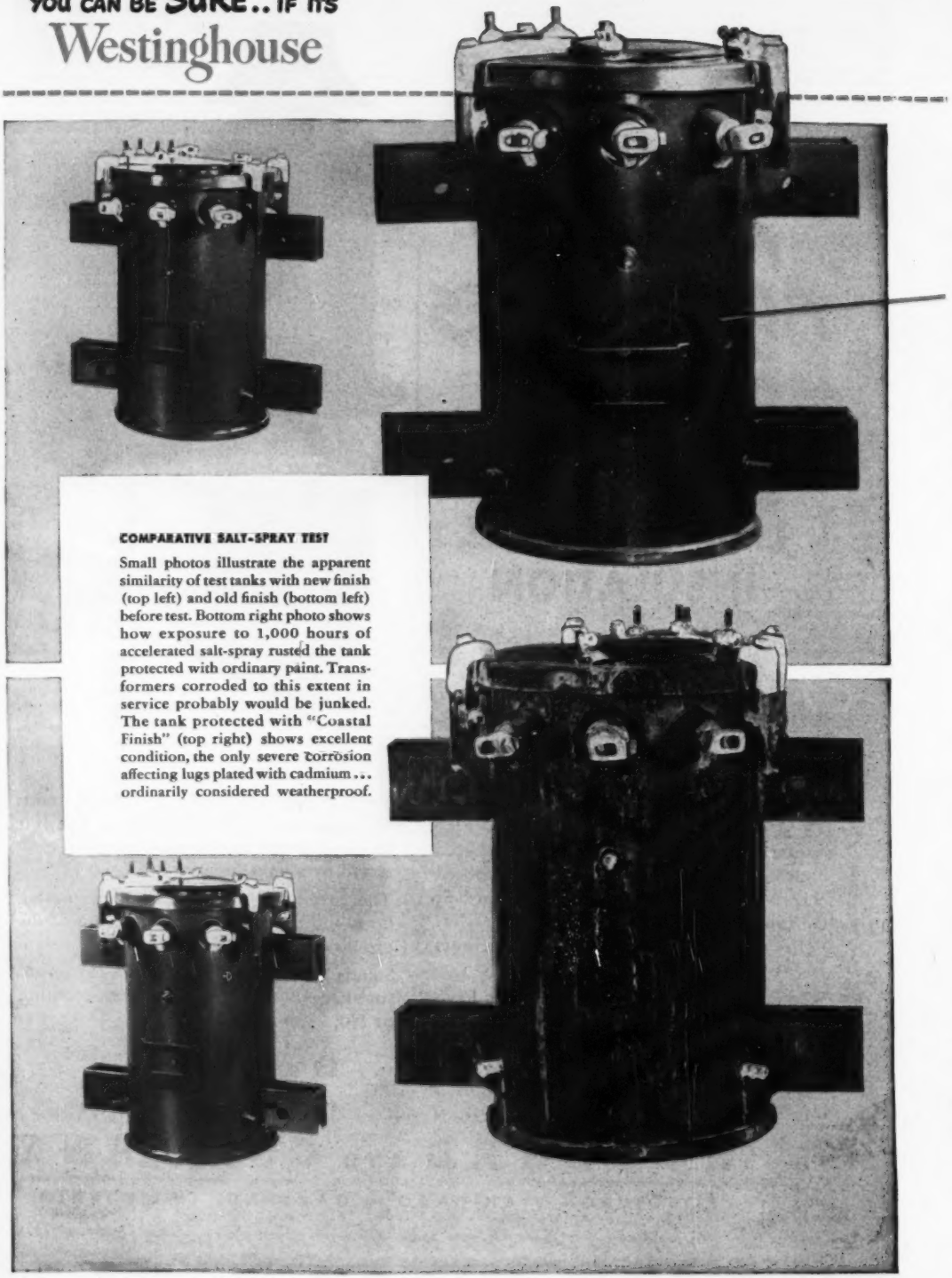
ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



COMPARATIVE SALT-SPRAY TEST

Small photos illustrate the apparent similarity of test tanks with new finish (top left) and old finish (bottom left) before test. Bottom right photo shows how exposure to 1,000 hours of accelerated salt-spray rusted the tank protected with ordinary paint. Transformers corroded to this extent in service probably would be junked. The tank protected with "Coastal Finish" (top right) shows excellent condition, the only severe corrosion affecting lugs plated with cadmium... ordinarily considered weatherproof.

—NEW "COASTAL FINISH"

New finish for Pole-Type Transformers adds years of protection under all service conditions

Greater resistance to chalking, cracking and rust! More than doubles the protective life of the finish! Adds years of service before repairing and repainting!

A new and better finish, developed in Westinghouse laboratories specifically to meet severe conditions of blistering heat, icy cold, rain, snow, salt and other corrosive atmospheres, *"Coastal Finish"* is now provided on all Westinghouse Distribution Transformers, "CSP"® and conventional.

"Coastal Finish" consists of a primer coat to inhibit rust, an intermediate coat containing mica flakes that overlap like shingles on a roof to provide superior moisture resistance, and a final gloss coat that improves appearance, and filters out ultra-violet sun rays. Infra-red baking assures complete hardening of each paint film.

Comparative weathering tests . . . salt-spray, acid and alkali resistance, and weather-o-meter . . . clearly show the advantage of *"Coastal Finish"* in all types of atmospheres. This is *another plus value* in Westinghouse Distribution Transformers. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-70576

Westinghouse
DISTRIBUTION TRANSFORMERS

5 REASONS WHY

BRONZE DISTRIBUTION CONNECTORS
Give You Better Service Under Any Operating Conditions

1—NO POWER OUTAGES FROM SEASONAL CRACKING OR STRESS CORROSION CONNECTOR FAILURES.*

2—WILL NOT LOOSEN FROM CONDUCTOR VIBRATION, EXPANSION OR CONTRACTION CAUSING CONDUCTOR DAMAGE OR BURNDOWN.

3—GREATER CONTACT PRESSURES SEAL OUT HIGH RESISTANCE OXIDE FORMATIONS ON CONTACT AREAS AND EQUALIZE CURRENT DISTRIBUTION IN CONDUCTOR STRANDS.

4—EACH COMPONENT MADE OF THE RIGHT ALLOY FOR A SPECIFIC ELECTRICAL OR MECHANICAL FUNCTION. CLAMPING MEMBERS ARE HIGH STRENGTH BRONZE.

5—BACKED BY MANY YEARS OF COORDINATED ELECTRICAL, MECHANICAL AND METALLURGICAL ENGINEERING KNOWLEDGE AND EXPERIENCE IN THE DESIGN AND MANUFACTURE OF PRODUCTS FOR THE ELECTRICAL INDUSTRY.

*TYPES K-90, K-900 AND K, KR ARE DESIGNED TO WITHSTAND MERCUROUS NITRATE TEST ABW SPECIFICATION 124-1 FOR PREDETERMINING SEASONAL AND STRESS CORROSION CRACKING FAILURES.

• OUR PRODUCTS ARE QUALITY CONTROLLED FROM INGOT TO FINISHED PRODUCT

ABW

Write today for Bulletins K-150 and K-175 on K-90, K-900 and K, KR Distribution Connectors

Consult one of our nearest 18 representatives or contact our main office

ANDERSON BRASS WORKS, INC.
POST OFFICE DRAWER 2151
BIRMINGHAM, 1, ALABAMA

• BRONZE AND ALUMINUM POWER CONNECTORS, FITTINGS, AND BUS SUPPORTS
ALUMINUM SUSPENSION AND STRAIN CLAMPS

of which operate sliding collector shoes.

Sliding current collector shoes (arrow) operating on a pantograph contact three sides of the bar.

Cleveland Crane & Engineering Co, Wickliffe, Ohio.

•

Porcelain Adherence Meter

A new instrument measures porcelain enamel's adherence to metal in terms of numerical units.

Adaptable to metals from 12 to 24 gauge the PEI Adherence Meter can be used on production parts as well as laboratory samples.

Porcelain Enamel Institute, 1010 Vermont Av, Washington 5, D. C.

•

Self-Supporting Cable

Two weatherproof neoprene or polyethylene covered aluminum conductors stranded about a bare aluminum neutral messenger are now available in a range of sizes for service drop and secondary line applications.

Aluminum Triplex is produced in AWG sizes 2, 4, and 6 with ACSR or reduced size ACSR messenger.

Kaiser Aluminum & Chemical Sales Inc, 1924 Broadway, Oakland 12, Calif.

•

Oil-Well Pumping Control

An oil well pumping control features new design in the magnetic starter, overload relay, motor disconnect switch, and lightning arrester. Other improvements are: A new starting timer giving more flexibility for starting motors after shutdown; time switch with new camriders for more

PROLONG TRANSFORMER LIFE

ONLY 3 SIMPLE STEPS

1. The Bowser method atomizes oil into minute particles to expose maximum surface area.
2. Volatile contaminants are then completely removed by high vacuum.
3. Dry colloidal particles are removed by microfiltration.

. . . by periodically treating transformer oil with Bowser insulating oil conditioners.

A survey of thirty utilities, continuously using this method of preventive maintenance for six years, revealed *not one transformer failure due to contaminated oil!* Transformers remained energized while the insulating oil was processed.

Best of all, this method eliminated replacement of insulating oil as well as its removal to a central point for reclamation with fullers earth or chemical treatment.

LOW COST—HIGH DIELECTRIC

The average cost of preventive maintenance was less than one cent per gallon per year. Oil dielectric was kept above 35 k.v. with a single pass, and the water soluble acid content was nearly zero.

NOW is the time to reduce your maintenance costs!
Write today for all the facts on Bowser conditioners.

BOWSER ESTABLISHED 1885

BOWSER, INC., 1384 CREIGHTON AVE.
FORT WAYNE 2, INDIANA

LIQUID CONTROL SPECIALISTS SINCE 1885

1. STAND SAFELY
2. TURN FREELY
3. REACH EASILY

with BUCKINGHAM Linemen's Equipment

Every piece of Buckingham equipment is rigorously inspected for quality — rigorously tested for safety — field-proven for comfort and convenience. It's this *dependable* quality and workmanship that has kept Buckingham "on top" for more than half a century.

Adjustable . . . Fits Any Man

1 BUCKINGHAM CLIMBERS

Now — adjustable tops are optional on any type Buckingham Climber! Adjusts from size 13 to 18½—gives every lineman an exact fit, far more comfortable than standard ½-inch sized climbers. Saves on inventory — one pair fits every man on crew . . . practical as extra climbers for service truck, plant, substation. Typical Buckingham quality and safety.

Turns 4½" Right or Left

2 TOOL BELT No. 1060

Glider-type belt allows freer body movement — lineman can turn up to 4½" without constantly shifting feet, binding clothes or cramping tools. Stout, tan-colored harness leather, rolled-edge liner, tough stitching. Typical Buckingham safety and comfort.

"Custom-Made" for Linemen

3 TOOL POUCH No. 4023

Best quality leather tool pouch—holds lineman's three most-used tools. Stoutly riveted. Fits belts up to 2" wide.

That's BUCKINGHAM on Top!

Second to none for
QUALITY
SAFETY
COMFORT

• Write for free Catalog No. 24 showing complete line. Or see one of Buckingham's 660 distributors.

BUCKINGHAM MANUFACTURING CO., INC.
1-3 TRAVIS AVE. BINGHAMTON, N.Y.

reliable time settings.

Feature of this control is its ability to withstand voltage surges of 22 kv crest with a 1.5x40 wave and a 10,000-amp current crest. An on-off indication is stamped on the base of the three-pole fusible disconnect switch. Any pole of the switch may be removed for repair and inspection. Further details are in Bulletin GEC 720.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

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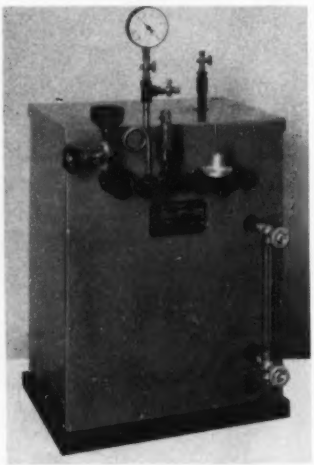


Electric Boilers

Low pressure boilers in the 1½ hp capacity range are available in three models—model 500 (100 psi), model 600 (200 psi), and model 700 (250 psi).

Available for 220, 440 or 550 volt operation these units require 15 kw for maximum steam output.

Heat is generated by the resistance of the boiler water between metal electrodes—thus if there is no water in the boiler, no current flows, and power input stops.

Livingstone Engineering Co, 100 Grove St, Worcester 5, Mass.

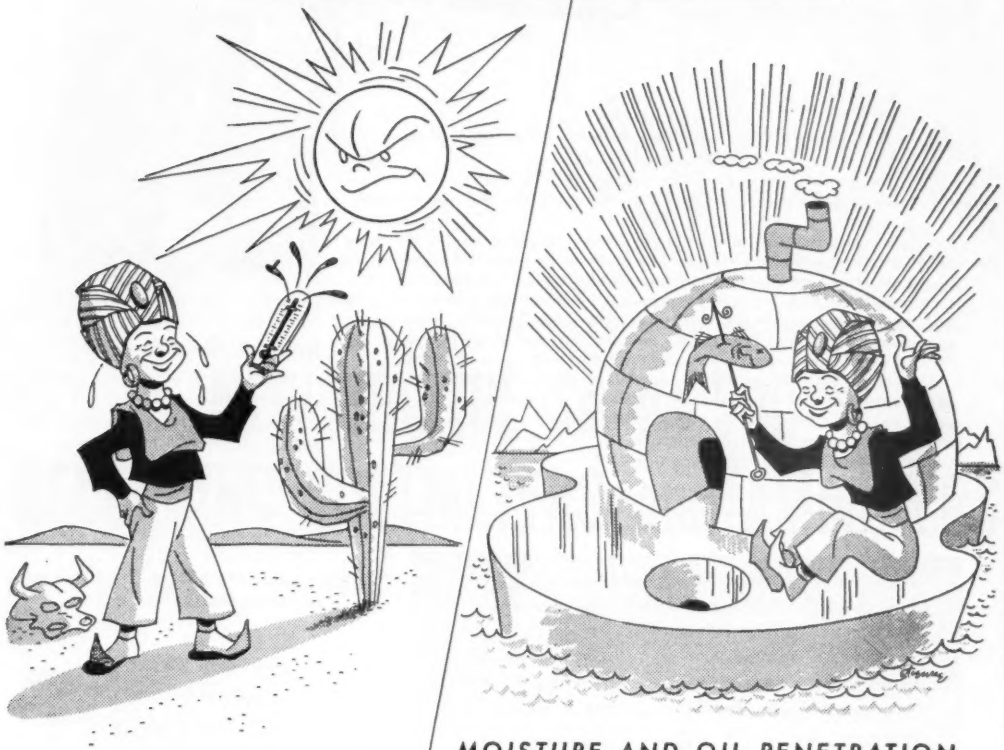
•

"Straight Line" Control

Fuel needs of controlled heating equipment is said to be anticipated by the Capacilline "straight line" control. By anticipating heat transfer lags, it automatically reduces to a minimum the on-off variations of a control instrument above and below the preset control point—enforcing a straight

Nothing stands up like MICA under ●●●

EXTREMES OF HEAT . . . and COLD



and

MOISTURE AND OIL PENETRATION

HIGH SPEED AND FRICTION

AGE AND OVERLOAD

when you think of MICA . . . think of MACALLEN

MACALLEN MICA

ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

THE MACALLEN COMPANY

16 MACALLEN STREET • BOSTON 27, MASS.

CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE.

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ENGINEERING CONSULTANTS

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both in years and diversity of operations in electric and gas utility field.

ORGANIZATION
large enough to do the job yet small enough to insure proper personal executive attention to your immediate problems and requirements.

Commonwealth Services and its engineering subsidiary, Commonwealth Associates, are new in name and outlook, but long established in organization and experience. Formerly the service company for the Commonwealth & Southern Corporation, Commonwealth Services and Associates have drawn together a group of individuals highly specialized in varied technical and economic fields and whose experience in problems of electric and gas utilities covers over 40 years.

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ABILITY · EXPERIENCE · RESOURCEFULNESS · RESULTS

line control on the heating variable.

It may be used to add the equivalent of proportioning control to any type of heating equipment with conventional on-off control. This includes ovens, furnaces, kilns, vats, molding or extrusion machines.

Wheelco Instruments Co, 847 W. Harrison St, Chicago, Ill.

•

Manual Starter

Available with both single and double-pole devices, class 2510 Type A starter will protect single phase a-c and d-c motors of 1 hp and less.

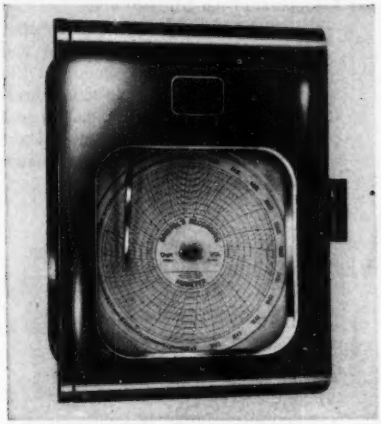
The starter incorporates trip-free overload protection which gives a definite trip indication and can be supplied with a pilot light for 115 and 230-v operation.

Square D Co, 4041 North Richards St, Milwaukee 12, Wis.

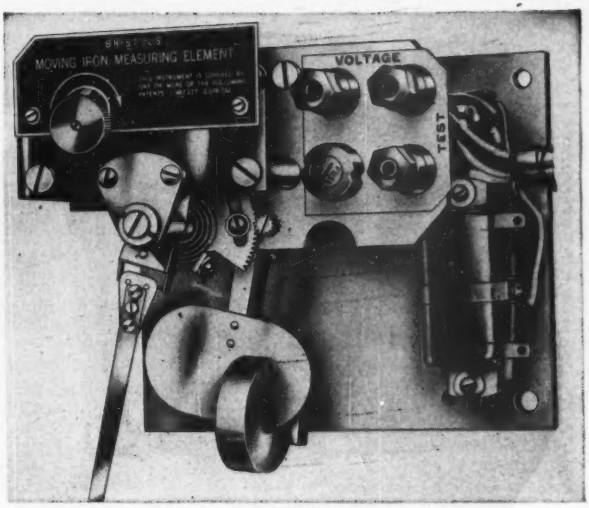
•

Home Heating Units

Room-by-room temperature control is obtained with wall-mounted electric home heaters controlled by a three-position switch. Available in nine ratings, varying from 1 to 6 kw, the units



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: **PORTABLE INSTRUMENTS** are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



NEW MOVING-IRON MEASURING MECHANISM. High torque, low burden, rugged construction for assurance that the original calibration will be retained through years of service. Shock-absorbing stainless steel bearings.

NEW BRISTOL Series 500 RECORDING VOLTMETERS and AMMETERS

THE LATEST DEVELOPMENT IN ELECTRICAL MEASUREMENT

Outstanding for—High actuating torque... Low electrical burden... Stability of calibration... Dependable accuracy

Here is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years of experience in building recording voltmeters and ammeters for almost every application.

The new moving-iron measuring mechanism is a type known for high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, snap-on chart plate.

To keep up with the latest in recording instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Look to
LARCH
for better
POLES

produced · treated · sold by
J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

Double-Life *Western Larch Poles*

J N *J. Neils Lumber Company*
Pole Division: LIBBY, MONTANA

operate from 230/240 v ac.

Nickel chromium heating elements, supported by ceramic columns and mounted in separate aluminum deflectors, provide double-action heating: by both infrared radiation and continuous circulation of heated air.

Westinghouse Electric Corp, Sunnyvale, Cal.

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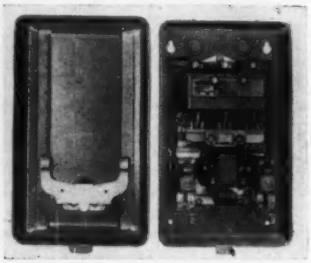


Motor Controller

Multi-turn magnetic blowouts are combined with twin break contacts in the CY-2 starter for a-c motors.

This unit is of mill type design and has standard NEMA mounting dimensions.

Clark Controller Co, 1146 East 152 St, Cleveland 10, Ohio

•

Hot-Line Poles

Hot-line poles are made by extruding Tenite plastic over a wooden core for high voltage lines.

Available in diameters of 1¼ to 2½-in. and lengths from 2 to 20-ft, these poles are fitted with attachments for such operations as changing insulators, fusing transformers, removing hot-line clamps, and operating switches.

Plastic coating is said to have a low

THIS MAN WOULDN'T NEGLECT

A MACHINE IN HIS PLANT

...yet he hasn't had a Chest X-Ray!

He checks every piece of mechanical equipment he owns for wear, lubrication, efficiency.

Yet he fails to take the simple precaution of a Chest X-Ray to make sure he does not have tuberculosis. *Not because he's opposed to the X-Ray. Simply because he is not sufficiently informed—or just hasn't taken the time and trouble, or does not realize the seriousness of the problem.*

A Chest X-Ray is the first step toward detecting tuberculosis in its early stages. And in its early stages it can be cured with the least loss of time from work.

So, if you're the man above, that one simple reason should make you get your Chest X-Ray—*today*. But listen, see how serious this really is:

Between the ages of 15 and 34, tuberculosis leads all other diseases as a cause of death—although at no age are you safe from TB. Yet, if everyone does his part by getting a Chest X-Ray periodically, and the majority of cases thus discovered are followed up, we can eliminate TB entirely as a public health hazard!

Will you do your part today? Get a Chest X-Ray. It may mean your life!

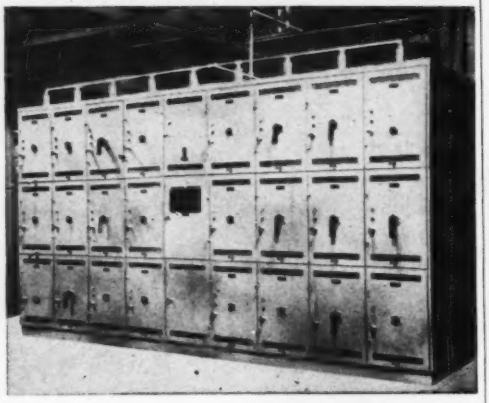
A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

Published in the public interest by:

McGRAW-HILL PUBLICATIONS

Round-the-Clock Fire Watchman

NOW ON DUTY



IN SWITCHGEAR CUBICLES OF LEADING SOUTHERN GENERATING STATION

Fire, even a small one, in generating station switchgear cubicles can short circuit distribution facilities...create unwarranted loss of voltage . . . destroy essential equipment.

That's why a leading southern power company recently installed, in one of its generating stations, modern, approved C-O-TWO fire protection.

Four automatic fire extinguishing systems were installed to protect the various switchgear cubicles from that inevitable, destructive enemy . . . fire. If fire should strike, quick-acting, clean, non-damaging, non-conducting carbon dioxide blankets the stricken area and extinguishes the blaze in seconds before it spreads and causes extensive damage. There is no after fire mess to clean up, no lingering odors, no water damage with carbon dioxide.

C-O-TWO offers complete carbon dioxide type fire extinguishing equipment . . . hand portables, wheeled portables, hose units, high pressure cylinder systems and low pressure storage tank systems; plus smoke and heat fire detecting systems and dry chemical type fire extinguishers . . . all render fast, positive action against fire.

So, whatever your fire protection problem, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today . . . tell us about your particular fire hazards, our experience is at your disposal. There is no obligation to you of course.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

moisture absorption and excellent resistance to outdoor exposure.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis, Mo.

•

Water Sterilizer

Electrically operated, the Speco ultra-violet sterilizer is reported capable of purifying badly contaminated water.

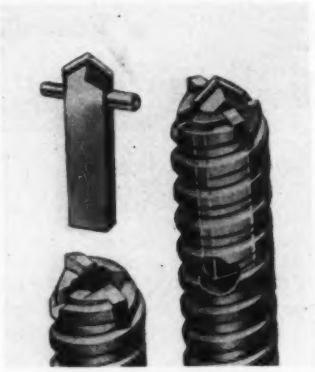
Four ultra-violet tubes extend vertically in water flowing through a 12-in. diameter 72-in. stainless steel tank.

This unit uses no chemicals and reportedly adds no taste or odor to the water.

Single units are rated at 400 gallons per hour.

Speco Corp, Pottstown, Pa.

•



Masonry Drill Bit

Carbide tipped, the Cyclo-Core drill bit is designed for drilling holes ¾ inch in diameter and larger in concrete or other masonry.

Machined spiral threads provide runways for removing dust from the hole as it is cut. Each bit has a port opening for cleaning out the core.

New England Carbide Tool Co, Cambridge, Mass.

•

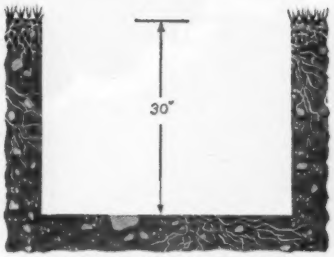
Transformer Valve

Designed principally for use on oil-immersed electrical equipment, (transformers, regulators, etc) the SFS valve is reported to have application on a variety of industrial equipment.

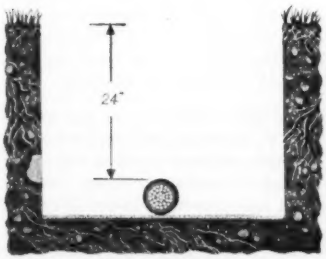
When used for sampling, valve is inserted close to the bottom of transformer tank. Inserted at the top of

How to install buried cables in trenches

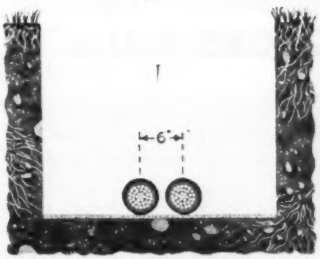
The most generally satisfactory way of installing buried cables is to lay them in a trench on a cushion of sand. There is less bending, distortion or tension than when a cable plow is used, a valuable factor if strains later occur through earth settling. The cable can also be protected by a treated plank or slab of concrete laid over it. Trenching permits the installation of cables at generally greater depths than does plowing. This greater depth makes cables less subject to damage by insects or rodents.



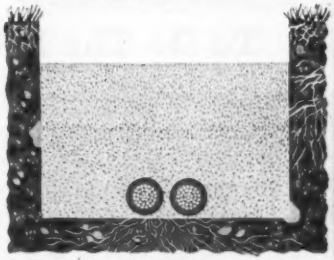
1. The trench should be deep enough (about 30") so that the cable, after providing the cushion mentioned below, will be at least 24" below the surface. This reduces the possibility of mechanical damage.



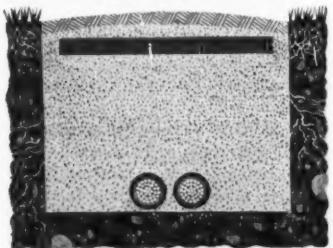
2. Put a cushion of sand on the bottom of the trench, or at least make sure the bottom is free of stones and other harmful debris. Lay cable with a slight snaking, to allow for earth settling and for expansion and contraction during load cycling.



3. When two or more cables are installed in the same trench, they should be spaced uniformly about 6" between centers so that the sand or earth can fill in around them. There must be no criss-crossing.



4. Cover the cable or cables to a depth of about 6" with sand or soft earth free from stones so that no rough edges will press against them.



5. Lay a concrete slab or creosote-treated plank on the sand or soft-earth refill, to protect the cable and warn workmen of its presence. Complete the refill. Under highways, streets and rights-of-way, cables should always be installed in conduit.

Because of today's scarcity of rubber and copper, great care should be taken to see that your installations last as long as possible. With a few simple precautions, you can extend the life of your cables under normal operation. Although these precautions are well-known to many, we repeat them in the interest of getting maximum efficiency and long life out of our material and resources.

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department

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Built Better At Highway To Do The BIG JOBS Better

Highway is America's major supplier of public utility line maintenance equipment. To produce it successfully is a job that can be done only by craftsmen long trained in this specialty.

Highway equipment has a reputation for being just a little better on every count. What's responsible for this is, we believe, something beyond engineering understanding and the finest in production facilities. It is an attitude—the unrelaxing determination to produce only the very best.

The body shown above, which carries a full crew to the job comfortably, plus all materials and equipment needed, is an example. It can be customized to incorporate *your* ideas, or purchased as you see it here.

We build all types of utility truck bodies—for general or special service of all kinds. See your Highway representative, call, or write.

HIGHWAY TRAILER COMPANY • Headquarters, Edgerton, Wis.

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HIGHWAY TRAILERS

Manufacturers of Utility Truck Bodies —Earth Boring Machines—Pole and Cable Reel Trailers —Winches—Power Take-Offs—Service Accessories — Commercial Trailers, Trailerized Tanks and Truck Tanks.

DESIGNED, BUILT, SERVICED— *"Just a little better"*

tank, the same valve can be used for venting air.

Oil-Rite Corp, 3475 South 13 St, Milwaukee 15, Wis.

MORE NEW PRODUCTS about which you should know

Eastern Metal of Elmira Inc, Elmira Heights 2, N. Y., is manufacturing a **Type A safety standard** designed to warn motorists approaching a work area. . . . Micro Circuits Co, New Buffalo, Mich., is marketing a closely related group of **electrically conducting paints.**

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa, has re-designed its **type URS single-phase regulator.** Re-design features a 33% reduction in floor area, weight, and oil. . . . Ateenate, Inc, 11 Sagmore St, North Quincy 71, Mass, has developed a process by which **name plates,** dials, etc, can be photographed directly onto stainless steel. Precise detail and corrosion resistance are obtained.

Houghton Laboratories Inc, Olean, N. Y., is making a series of four **industrial adhesives** based on ethoxyline resins. Available in liquid, powder, and rod forms these materials can be cured at room or elevated temperatures. . . . Gedney Electric Co, New York 20, N. Y., is manufacturing **point and cap fittings** for driving galvanized pipe.

The Bell Electric Co of Chicago, Ill., has introduced a **safety duplex receptacle** which automatically closes when outlet is not in use. . . . Metron Instruments Co, 432 Lincoln St, Denver 9, Colo., is now manufacturing a miniature **variable speed drive** with lever type speed control. Unit has ratings up to 2 pounds inches torque, 0.025 hp, 20,000 rpm. Ratio is infinitely variable from 1/6 to 6.

Dilectrix Co, 60 East 42 St, New York 17, N. Y., has developed a method of casting Teflon, a resin with excellent dielectric qualities, heat resistance, and chemical inertness. **Sheeting** in thicknesses as low as 0.005-in. are available. . . . American Silver Co, Flushing, N. Y., is now manufacturing a **steel strip clad with silver** brazing alloy.

WHAT THEY'RE SAYING
at industry meetings

Future Financing

Harry A. McDonald, *chairman, Securities and Exchange Commission, at the annual convention of the Michigan Gas Association and the Michigan Electric Light Association, Mackinac Island.*

Confidence in the stability of utility securities places upon management a heavy responsibility in the present critical period. These responsibilities are in future construction, future financial programming and future dividend policy.

The construction situation is such that despite the heavy expansion program which now has been under way more than four years, electric power in the winter of this year will be tighter than in any year since 1948. While individual managements will spare no effort to meet the needs of their communities, imposition of new demands on top of a tremendous postwar, peace-time growth may raise some question as to the ultimate dependability of the present high level of consumption. Prudence requires that we take this into account in planning our future financing.

The utility industry is also faced with an increased tax burden. For some companies higher tax rates may constitute a threat to their present level of dividend payments, but even where this point is not reached the greater percentage of dividend payout will leave a smaller amount of retained earnings available for construction. Absence of these funds will mean heavier reliance upon outside financing.

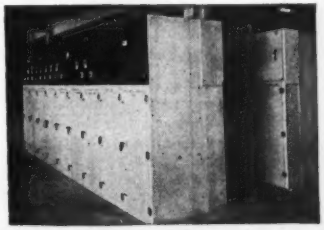
This additional drain on net earnings should not become a deterrent to further equity financing nor should the disparity in capital costs as between debt and equity financing control the choice of issue. The continuance of regular equity financing is the best guarantee of sound operations, not only for the investor but also for the consumer.

Because adequate equity, predicated upon adequate income return, is closely related to the factor of public interest, it must remain the common concern of both management and the various regulating agencies. Over re-

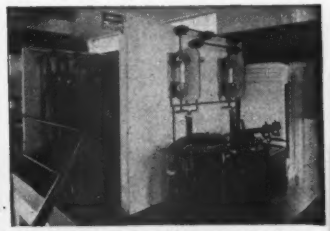
WHY STATION EXPANSION PROGRESSES FASTER . . . COSTS LESS

with Trancell Materials

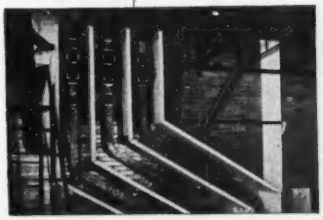
If you're planning to expand your power stations or substation facilities, do what many leading power companies have already done . . . make your station change-overs with Johns-Manville Trancell Materials.



They're safe—fireproof . . . have low heat conductivity . . . adequately isolate high-voltage apparatus.

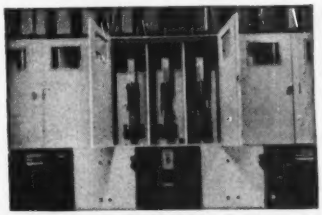


They're neat—make clean, flush-type housings, panels, doors, and partitions.



They're handy—easily cut and drilled on the job, or furnished cut to your specifications.

They're durable—rotproof and rustproof . . . will last for years. Require a minimum of maintenance.



They're economical—light, easy to handle and assemble. Have excellent re-use value.

—for all high voltage power equipment enclosures—Johns-Manville Trancell Materials are made in many sizes and types. Recommended for transformer and switch gear housings and partitions; bus bar enclosures and other services. For further information write to Johns-Manville, Box 290, New York 16, New York.

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TRANCELL

an asbestos product for housing electrical equipment

Penta Preserved Poles
cost no more than other treated poles

You'll get lots of praise from linemen, installers and trouble-shooters when you start using Penta-protected poles. That's because Penta Preservative treatment is clean—easy on the men who climb the poles.

You can absolutely depend on Penta for protection from insect attack and decay. Even after years of service, you'll find no ground line decay, shell rot, top rot, or insect damage in Penta-treated poles and cross-arms.

That's because PENTAchlorophenol is a powerful, stable and uniform wood preservative—allows measured and positive protection. It's always the same! Penetrates deeply and will not leach out. Doesn't affect conductivity, creates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other commonly used types of preservatives. Write us for complete facts and names of companies supplying Penta-treated forest products.

CHAPMAN CHEMICAL COMPANY
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CHAPMAN™

Penta Preservative

Conforming to A. W. P. A. Specifications P8-49 and P9-49

liance on debt, because it is cheap and has certain tax advantages, is a short-sighted policy. High debt ratios in time bring lower credit rating and this in turn brings higher debt cost and higher equity cost. It can be demonstrated easily that a properly balanced capital structure with an adequate equity base means better credit, lower debt cost and better price-earning ratios.

Insurance Fund Investment

Charles Sawyer, *secretary, United States Department of Commerce, at anniversary banquet of the Massachusetts Mutual Life Insurance Co, New York City*

The life insurance companies manage huge reservoirs of funds for investment. They constantly face the problem of a proper and timely investment of funds for the benefit of their policy holders. In investing these funds they must sense their part in the development and strengthening of our capitalistic and democratic system.

In the past 100 years, insurance funds have financed railroads, farms, public utilities, private homes. Today, during mobilization, funds should be invested in essential industries: Firms which have received Certificates of Necessity; electrical power systems; pipelines; and additions to rolling stock.

Improve Financial Statements

Charles E. Headlee, *controller, Westinghouse Electric Corporation, at the 32nd annual international cost conference of the National Association of Cost Accountants, Chicago.*

Many corporations have published figures during the last six to nine months which have to be read with more accounting judgment than can be expected on the part of every one taking action based on them.

Taking advantage of this situation, there are those who use accounting statements for personal advantage. Politicians obtain votes from numerous workers by discrediting and berating their less numerous employers. Labor leaders try to secure for their constituents a greater share of the gross income dollar.

The obvious remedy is to improve statements prepared for internal and public reading. However, this improvement hinges on changes in present accounting practices.

BIDDLE
Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 5 OF A SERIES

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

MOTOR DRIVEN "MEGGER®" INSULATION TESTERS

Ranges up to 50,000 megohms at 2500 volts D-C.

USES

1. Where a number of tests are made at one location, as in testing separate conductors in telephone cable.
2. For dielectric absorption measurements on the insulation of generators, transformers and cables.
3. Where high resistance values need to be measured continuously, such as for indicating the moisture content of paper in production.
4. As a convenient source of low energy test potential at comparatively high d-c voltages.

Motor-driven "Megger" Sets are simple to operate, direct-readings by pointer deflection, rugged and portable; and they are of sufficient range and accuracy for most practical purposes.

DESCRIPTION

The motor-driven "Megger" Insulation Tester is similar to the well-known hand-operated set except that the d-c generator is driven by a motor which can be connected to a convenient outlet.

The generators in motor-driven sets have bearings and other features properly designed for motor operation. They are for continuous, or 24-hour duty. The driving motors which are rubber-mounted to reduce vibration are usually rated 1/20 hp, 115 volts, 60 cps. Other voltage and frequency ratings can be supplied.

The motor and its supporting bracket can be removed quite easily from the instrument case and the set made available for hand operation where an external source of current may not be available. This change can be made in the field.

For complete information write for *Bulletin 21-20-EW.*

Photo courtesy Philadelphia Electric Co.

ELECTRICAL MEN IN INDUSTRY PREFER THIS DEPENDABLE AND RUGGED INSULATION TESTER

For average industrial requirements the Meg type of Megger® Insulation Tester is by far the most popular set we supply. This incomparable "trouble shooter" has ranges up to 2000 megohms with hand generators up to 1000 volts d-c. It is also supplied with a plug-in rectifier power supply either instead of or in addition to the hand generator.

The performance and endurance records which these instruments have achieved are difficult, if not impossible, to match in any type of portable testing device. For insulation resistance measurements—"Megger" instruments are the recognized standard.

Anyone can measure electrical insulation resistance in generators, motors, wiring and other electrical equipment with a Megger instrument—quickly—easily. Simply make connections, turn the crank and read the position of the pointer on the scale—no dependence on batteries or other source of test current; the built-in generator is always a ready and dependable source of supply.

Learn more about these "indispensable" tools today by writing for *Bulletin 21-45-EW.*

HERE'S A "GOOD COMPANIONS" KIT FOR PRACTICAL ELECTRICAL ENGINEERS AND MAINTENANCE MEN

Men concerned with all-around-the-plant electrical tests and resistance measurements tell us that these are "indispensable" tools:

Midget Megger Tester Insulation for detecting dirt, moisture and deterioration in advance of failure, or as a trouble-shooter after failures occur.

The Midget Megger Circuit Testing Ohmmeter for measuring conductor resistance of coils, contacts and relays, and checking continuity of circuit and grounded parts.

Be sure to write for your copy of 21-85-EW. today.

NEWS ABOUT PEOPLE

LaCroix Appointed Head of NEES Subsidiaries

Arthur E. LaCroix has been elected president of Connecticut River Power Co, N. H., and Bellows Falls Hydro-Electric Corp, Vt., and executive vice president of New England Power Co, Mass. All are wholesale subsidiaries of New England Electric System. LaCroix replaces Arthur E. Pope who is giving up active executive duties.

A. E. LACROIX

Executive vice president of New England Power Service Co since 1944, LaCroix has resigned this position to take over his new responsibilities. He joined New England Power system in 1916 in connection with its hydroelectric developments on the Deerfield River in Massachusetts. In the following years he held various executive positions in subsidiary companies of the system, becoming assistant vice president of the New England Power Association in 1936 and vice president of its three major wholesale companies in 1941.

Pope, president of New England Power Co since 1932, has served the system since 1911 when he started as assistant to the president of New England Power Co. He later became electrical engineer of the affiliated Power Construction Co. In 1913 he was transferred to Worcester as electrical engineer of New England Power and was made assistant general manager a year later. When New England Power Association was organized in 1926 Pope was appointed vice president in charge of operations. He will continue as director of the three wholesale companies and as a consultant.

•

Indiana Utility Appoints 3 to Head New Departments

New engineering duties have been assigned by Public Service Co of Indiana in a reorganization move creating three new departments.

J. J. Trainor, chief engineer of the company, has been transferred to the executive offices as head of the System Planning and Plant Construction Department. He assumes responsibility for general planning of the system and coordination of power plant design and construction.

E. C. Woods, as superintendent of system operation, has been made head of the System Operation Department. He will direct the operation of all generating stations and the transmission of power, and will coordinate with the divisions the construction of transmission facilities, including substations.

The General Engineering Department will be headed by W. A. Schulz, formerly transmission engineer. His department will establish standards of design and engineering in connection with transmission, distribution, substation, street lighting, and other required facilities.

Each of the new departments will be under the direct supervision of Frank D. Danielson, vice president of the utility.

•

Merritt A. Giles, formerly superintendent of electric transmission and distribution in the Akron division of Ohio Edison Co, has joined Pennsylvania Power Co as general supervisor of operations. He will be in charge of power production, transmission and distribution, meter and appliance service, and engineering. Before serving with Ohio Edison Giles was superintendent of the Central Engineering Department, Ohio Public Service Co.

Dale McFeatters Gets New Westinghouse Post

Westinghouse Electric Corp has appointed Dale McFeatters director of its newly formed Department of Information Services. The new department includes the functions of public relations, employee relations, and related activities.

McFeatters has served as director of employee information since joining Westinghouse in 1945. Before that time he had been business editor of the "Pittsburgh Press."

DALE McFEATTERS

A number of executive appointments have been made in the new department. Charles N. Fry, former manager of general publicity in the public relations department with headquarters in New York, has been named manager of public relations. Charles A. Ruch, editor of "Westinghouse News" has been appointed manager of employee information. Replacing Ruch as editor of the "News" is John B. Campbell, formerly of central publicity, public relations department.

Charles A. Scarlott has been made manager of technical information in the new organization. He will continue to edit the "Westinghouse Engineer."

•

Walter Ankrom, industrial power engineer at Lima for Ohio Power Co, has been appointed supervisor of indus-

THESE ARE LIGHTNING ARRESTER HOUSINGS

They are produced by us in scheduled volume, for one of the leading manufacturers. They are typical of many such pieces made by Lapp which contribute to operating security of your systems, and to production efficiency and economy for the manufacturers of equipment in which porcelains are used.

Requirements for these pieces are complete electrical reliability, and accuracy of physical dimensions. The arresters for which these are housings must be sealed, permanently moisture-proof. For manufacturing economy, production assembly is highly mechanized. The crimp cap mechanical seal requires porcelains of very close dimensional tolerance.

Such tolerance is not easy, since porcelain clay, between its initial plastic state to fired piece, undergoes a shrinkage of about 30%. But Lapp techniques have developed the facility of close control. Lapp Vacuum Process clay and special mixing procedures provide a body which is uniform and reliable, batch-to-batch, day-to-day, year-to-year. And this piece is produced by the Lapp dry-turning technique—a clay blank dried to chalky whiteness, during which most of the shrinkage is accomplished, and then formed by lathe-turning. Quality and uniformity are protected through Lapp glazing methods, and precision-controlled firing.

It is an exacting requirement we meet for this customer. We are proud to have been his supplier through many years. We are pleased also to have been porcelain supplier to many other manufacturers who insist on supplying the best in their equipment. Such equipment offers a margin of operating security. For—although *you can buy cheaper porcelain—you can't buy better porcelain*—than Lapp. Lapp Insulator Co., Inc., Le Roy, N.Y.

Lapp

Cable Spinning in Field with Neale Model "K"

1. One-third LOWER INSTALLATION COST than with pre-assembled cables.
2. SAVES SPACE over open-wire construction in congested areas.
3. Provides EXTRA PROTECTION against storm damage.
4. Light weight single conductor cables can be handled in 300% GREATER LENGTHS than heavy pre-assembled cable. Reduces number of splices and installation labor costs.
5. REDUCES CABLE INVENTORY, as 1/c, 2/c or 3/c cables may be made up in the field as required. Invaluable in emergencies.

NEALE MODEL "K" SPINNER spins a single cable, or three 2" cables into a compact triangular pattern. Apex of triangle points down. Strand lies in groove formed by two top cables.

Drum rotated by two friction drive wheels which are rotated by wire being pulled from drum. Regardless of condition of strand, drum revolves once when 13" of wire is pulled. Drum carries two spools of spinning wire spaced to spiral 6½ inches apart for ample cable support.

Magnesium castings used wherever possible for lightness and strength. Weight approx. 36 lbs. Length 18½", 12" diameter, 4¾" exit.

NEALE Spinning Wires available in seven different types and sizes.

CABLE SPINNING EQUIPMENT CO.
TOPEKA, KANSAS Phone 3-1829

trial sales in the company's Canton general office. He succeeds **Elmer F. Shaffer** who has been made commercial-industrial manager of the company's southern division at Newark. **Richard T. Boswell** replaces Ankrom at Lima. He has been industrial power engineer at Canton since 1946.

Stuart W. John, public utility rate consultant, has been appointed head of Commonwealth Services Inc's rate department. Associated with Dallas Power & Light Co for 16 years, he became head of the company's rate and economic research department in 1943. He joined Ebasco Service in 1947 following service in the Navy.

•

GE Makes O'Brien Head of Apparatus Marketing

William V. O'Brien, a commercial vice president of General Electric Co, is the new manager of the company's Apparatus Marketing Division. He replaces Chester H. Lang, vice president, now in charge of GE's public relations organization (EW, July 2, p 56).

W. V. O'BRIEN

O'Brien has been assistant manager of marketing policy for the company and a commercial vice president since 1950.

He joined GE's test course for student engineers at Schenectady in 1922. After serving in several sales engineering capacities in the company's Southeastern District, he returned to Schenectady to assignments in the Central Station Division and Lighting and Cable Division. O'Brien became manager of the Wire and Cable Division in 1940 and assistant manager of the Central Station Divisions in January, 1945. Later the same

It's time we got *working* mad!

As we listen to the latest insults from Moscow, we're likely to get fighting mad.

Instead, we'd better use our heads and get *working* mad.

It is clear by now that Stalin and his gang respect just one thing—strength. Behind the Iron Curtain they've been building a huge fighting machine while we were reducing ours. Now we must rebuild our defenses—*fast.*

As things stand today, there is just *one* way to prevent World War III. That is to re-arm—to become strong—and to stay that way!

This calls for better productivity all along the line. Not just in making guns, tanks and planes, but in turning out civilian goods, too.

Arms must come first. But we must produce arms *at the same time* we produce civilian goods.

We can do this double job if we all work together to turn out more for every hour we work—if we use our ingenuity to step up productivity.

All of us must now make sacrifices for the common good. But we're working for the biggest reward of all —*peace with freedom!*

THE BETTER WE PRODUCE THE STRONGER WE GROW

A PUBLIC SERVICE PROJECT • THE ADVERTISING COUNCIL •

FOR A FREE COPY OF "THE MIRACLE OF AMERICA"

MAIL THE COUPON to Public Policy Committee, The Advertising Council, Inc., Dept. B.P., 25 West 45th Street New York 19, N. Y.

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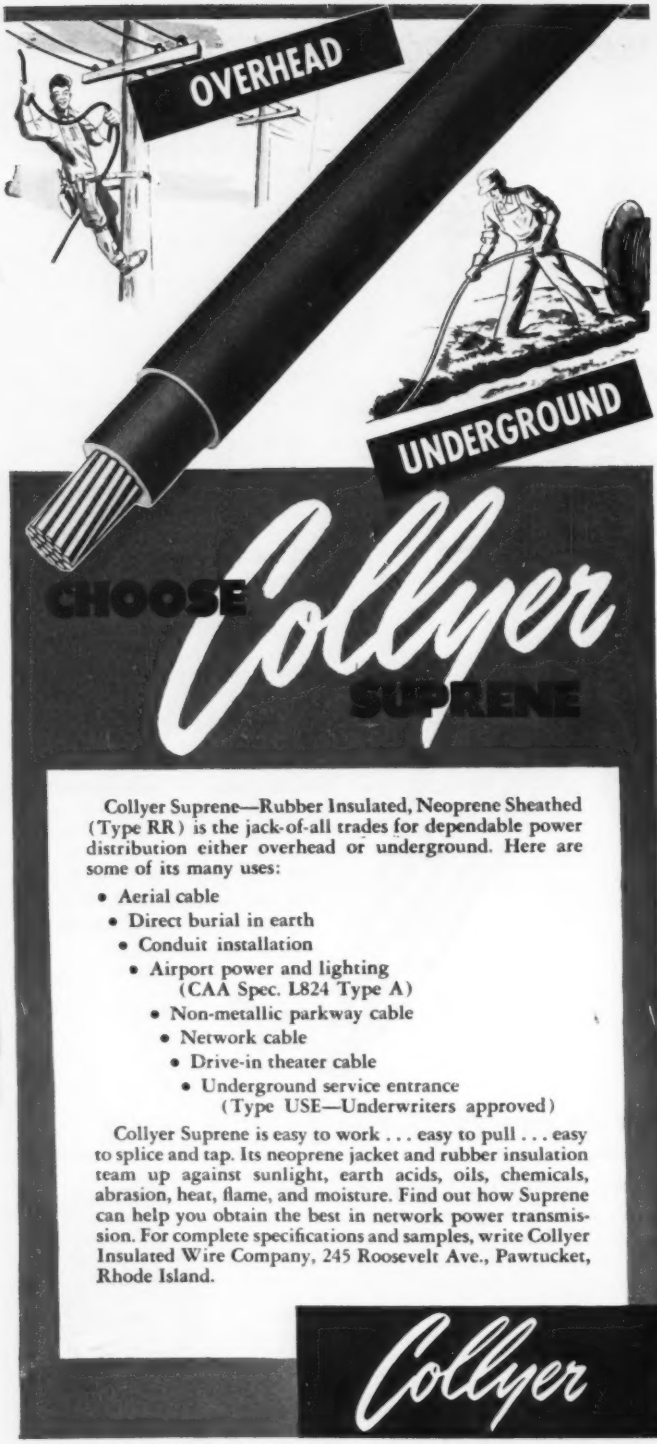
OVERHEAD
UNDERGROUND
CHOOSE
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SUPRENE
Collyer Suprene—Rubber Insulated, Neoprene Sheathed (Type RR) is the jack-of-all trades for dependable power distribution either overhead or underground. Here are some of its many uses:
• Aerial cable
• Direct burial in earth
• Conduit installation
• Airport power and lighting (CAA Spec. L824 Type A)
• Non-metallic parkway cable
• Network cable
• Drive-in theater cable
• Underground service entrance (Type USE—Underwriters approved)
Collyer Suprene is easy to work . . . easy to pull . . . easy to splice and tap. Its neoprene jacket and rubber insulation team up against sunlight, earth acids, oils, chemicals, abrasion, heat, flame, and moisture. Find out how Suprene can help you obtain the best in network power transmission. For complete specifications and samples, write Collyer Insulated Wire Company, 245 Roosevelt Ave., Pawtucket, Rhode Island.
Collyer

year he was made manager of the Central Station Divisions.

Appointed assistant manager of sales for the Apparatus Department in 1947, O'Brien was made general sales manager in 1948.

Lang, a GE vice president for the past ten years, directed industrial marketing for the company's Apparatus Division before being named to his new post in charge of public relations. He will make his headquarters in New York.

He joined the company as a traveling auditor shortly after World War I. In 1922 he became assistant manager of the publicity department at Schenectady and four years later was appointed comptroller of the budget for GE.

Lang became advertising manager, manager of the publicity department, and manager of broadcasting in 1932. Eight years later he was named manager of sales for the Apparatus Department and the following year he was elected a vice president of the company.

•

Lyall G. Ireland, vice president and chief engineer of New Orleans Public Service, Inc, has retired after nearly 27 years of service. He joined the company in 1926 as assistant to the vice president when Citizen's Light & Power Co, for which he was manager, was merged with New Orleans Public Service. Ireland was named vice president in charge of operations in 1931 and vice president and chief engineer in 1939.

L. H. Hardin, superintendent of the Camden, S. C., municipal utility system, has resigned to accept an executive position with the hydrogen-bomb project near Augusta, Ga.

OBITUARY

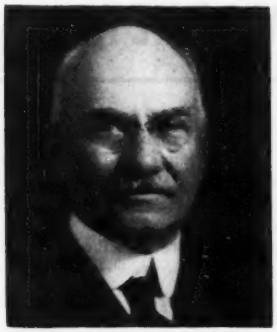
Dr D. C. Jackson

Dr Dugald C. Jackson, 86, professor emeritus of electrical engineering at Massachusetts Institute of Technology and retired head of the electrical engineering department, died at Cambridge, Mass., July 1.

Dr Jackson was co-founder with the late Dr Edward Moreland (EW July 2, p 122) of the Boston engineering firm of Jackson & Moreland which

took part in many hydroelectric projects.

He came to MIT in 1907 and served



Dr D. C. JACKSON

as head of the electrical engineering department until his retirement in 1935. Prior to that he had been head of the department of electrical engineering at the University of Wisconsin for 16 years. Before entering the teaching field Jackson worked as chief engineer of the central district of the Edison General Electric Co.

Recipient of many engineering honors, Jackson served as president of the American Institute of Electrical Engineers. He was awarded the association's 1938 Edison Medal and received the Lamme Medal in 1931.

•

Roy R. Robley, 76, former assistant to the vice president of Portland General Electric Co, died June 25 at Portland, Ore. He retired from the company in 1947 after 42 years of service. Starting as a wireman in 1904 he became superintendent of operations in 1926 and was made assistant to the vice president in 1940.

Charles Fenn, 74, superintendent at Florida Power & Light Co's West Palm Beach plant for 30 years, died in that city June 24.

Thomas H. McCauley, 78, retired general manager of the former New Brunswick Power Co, died at Toronto, Ont., June 25.

George W. Tesch, 50, industrial sales engineer for Wisconsin Public Service Corp, died recently at Green Bay, Wis.

Lee W. Harris, retired production manager of the Link Belt Co, died July 4 at Melrose Park, Pa.

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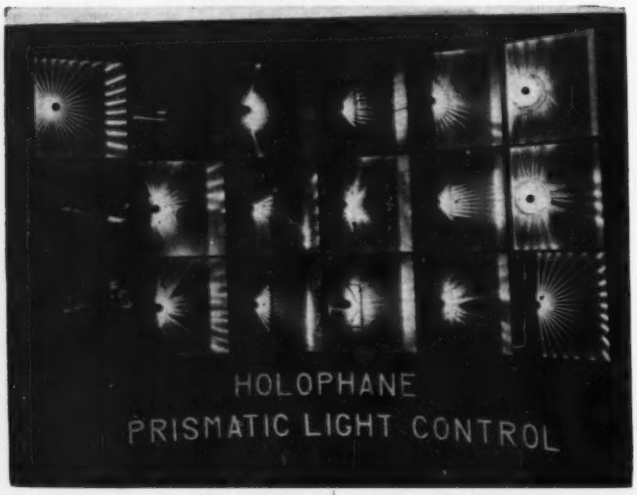
MANUFACTURERS and MARKETS



PRISMATIC CONTROL of light is demonstrated by control board which forms a wall of Holophane Co's new Light and Vision Institute. Each compartment shows a specific example of how light has been redirected by using prismatic fixtures

Light, Vision Institute Opened by Holophane Co

Holophane Co, Inc, New York, recently opened a Light and Vision Institute, feature of its newly enlarged executive offices. The institute consists of a lecture hall and showroom for the presentation of lighting methods and prismatic control.

Dominating one entire wall of the hall is a light control board divided into a series of compartments. Each of the compartments shows a specific example of redirecting light through prismatic control. Also on display are many of the company's 118 refractors and 80 lenses used in its lighting devices.

One application of lighting employing prismatic control, demonstrated at the institute, shows how surgery lighting delivering 3,000 ft-c, built into the ceiling, can facilitate the televising of operations.

The lighting devices do not require extensive use of critical materials. The company has developed designs suitable for commercial, industrial, and institutional lighting.

Architects, engineers, students, and representatives of public utilities, industrial safety groups, optical societies, and electrical distributors are among the groups invited by the company to visit the institute.

•

Westinghouse Grants 9c Hourly Pay Increase

Westinghouse Electric Corp has granted a wage increase of 9c an hour, retroactive to April 16, to unions representing the majority of its employees.

Westinghouse officials said the company would not seek price increases on its products to offset the wage boost which will cost the company $20 million a year.

The increase, which is about 3c above the 10% wage formula, has been approved by the Wage Stabilization Board. It will benefit 43,000 members of the International Union of Electrical Workers, CIO, and 6,000 members of the International Brotherhood of Electrical Workers, AFL.

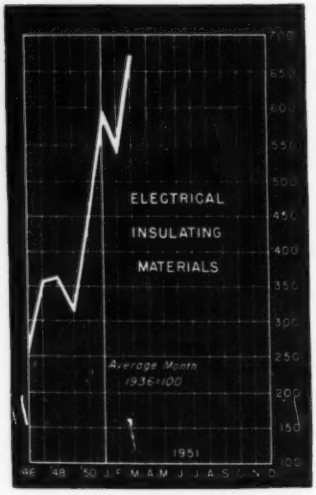
A similar proposal has been made to 16,500 Westinghouse employees belonging to the United Electrical, Radio, and Machine Workers of America, independent, and 13,000 employees who are members of the Federation of Westinghouse Independent Salaried Unions.

•

Insulating Materials Sales Rise Sharply in March

Sales of electrical insulating materials increased in March 20% over those recorded during February.

The index of sales billed compiled



by the National Electrical Manufacturers Association shot up to 662 in March compared with 552 in the preceding month. March sales were 63% higher than those for March, 1950, when the index read 406.

MANUFACTURING BRIEFS

Sylvania Electric Products, Inc, has selected Nelsonville, Ohio, as the location for a plant to produce welded lead-in wires for lamps, radio tubes,

Here's Why VICTOR Guy Strains NEVER LET YOU DOWN!

V THEY'RE STRONG! VICTOR'S de-airing process produces porcelain of maximum density and tensile strength.

V THEY'RE MADE OF HIGHEST QUALITY WET PROCESS PORCELAIN designed and manufactured to give unequalled mechanical and dielectric characteristics.

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VICTOR Guy Strains are better because our engineers, technicians and craftsmen have the "know-how" to make them better! Each one is made with the same high grade materials and careful workmanship as are VICTOR's famous high voltage insulators. That's why more and more power companies are specifying VICTOR Guy Strains—the standard of the industry.

Do You Know that...

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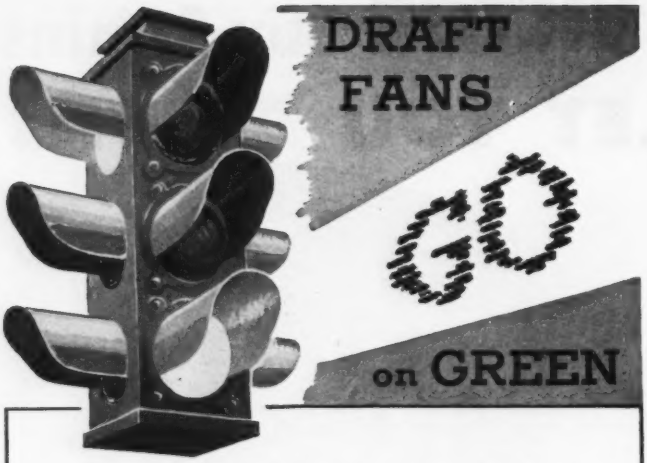

A Big Draft Job Handled Capably by Green Fans

Twenty-four large Green Fans take care of a heavy draft load at the Venice (Illinois) Plant of the Union Electric Co. of Missouri. Each of six boilers has two sets of Green Fans, each set consisting of one induced draft fan and one forced draft fan coupled to one motor as a unit. With the heavy demands on this station, all boilers are usually in service continuously, thus throwing an unrelenting burden on the fans.

Engineers whose responsibility it is to recommend or accept draft fans for large power plants certainly want efficiency and low operating costs. But they don't overlook the maintenance and replacement angles. They want the sound designs of competent experienced fan engineers. They also want the care in construction that is found in shops of a company that has built up an international reputation as the "authority" on draft fans. They know that such a company will not tolerate sloppy shop work.

Green is this authority on mechanical draft fans.

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THE GREEN *Fuel Economizer* COMPANY INC.

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and other electronic devices. The company has leased a factory building in the city on a temporary basis and will begin operations shortly. A new plant will be built by the city and Sylvania will shift to the new building when it is completed.

Construction work has begun at Westinghouse Electric Corp's new lamp manufacturing plant near Reform, Ala. The building will be L-shaped and will contain 125,000 sq ft of floor space. When completed early in 1952, the plant will employ 400.

Doerr Electric Corp is the new name of Electro Machines, Inc, Cedarsburg, Wis. The change was made to prevent confusion between the company's old name and similar firm names.

SALES ASSIGNMENTS

COMPANY STAFFS

Hotpoint, Inc, Chicago, has named W. R. Hall Boston district manager replacing F. L. Cashman, who has resigned. J. H. Kidd, zone manager in Denver, has been appointed zone manager in Dallas. V. P. Owen, Dallas zone manager, has been transferred to the same position in Philadelphia, and L. W. Hitchcock, former Atlanta zone manager, is taking over as zone manager at Cleveland.

Bridgeport Brass Co, Bridgeport Conn., has appointed L. E. Menns Pacific Coast sales manager. Menns has been Los Angeles district manager and will be in charge of the San Francisco district office as well. He will be responsible for the sale of all the company's products on the Pacific Coast.

General Electric Co has named Jack M. Lime manager of the Buckeye sales district of its Lamp Division. He formerly was manager of the company's Midwest sales district with headquarters in Kansas City, Mo. Dean M. Warren has replaced Lime as manager of the Midwest sales district.

Kaiser Aluminum & Chemical Sales, Inc, Oakland, Calif., has moved its product sales offices for electrical conductor and rod, bar, and wire from Newark, Ohio, to the company's general sales offices 919 North Michigan Ave, Chicago. Gillette N. Houck is in charge of sales for both product divisions.

Metal Prices
July 9, 1951

COPPER, Conn. Y, lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits, qual. N. Y., lb	1.06
ALUMINUM, ingot, base price	.19
NICKEL, base price	.59½
STEEL billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Ala., Mobile—Alabama Power Co., 600 N. 18 St., Birmingham, Barry Steam Electric Plant, $30,000,000.

Arizona-Nevada — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, furnishing, del. f.o.b. cars shipping point or f.o.b. Kingman (Louise) Ariz., structural steel for 69-kilovolt transformer circuit for Davis Power Plant, Davis Dam Proj., Spec. DS-3471. L. N. McClellan, ch. engr.

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Delano, Calif. switchboards and starters, cabinet, switches for Pumping Plants S-4 to S-10 inclusive and S-12 to S-17 inclusive in laterals 124.5E, 127.E and 130.4E and unit 3, Southern San Joaquin Municipal Utility Dist. Friant-Kern Canal Distribution Canal Distribution Systems Central Valley Proj. DS3480. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, one controlling and two controlled station supervisory control and telemetering switchboard cubicles and equipment and one lot carrier-current equipment for Willow Creek pumping plant and dam and Gramby Pumping Plant, Colorado-Big Thompson Proj. Spec. DS-3476; furnishing, del. f.o.b. cars shipping point or f.o.b. Loveland, butterfly valve control sys., and accessories for pump-turbine bypass, Sec. DS-3474; furnishing del. f.o.b. cars shipping point or f.o.b. Campion, valves for penstock intake both at Flatiron Power and Pumping Plant, Colorado-Big Thompson Proj. Spec. DS-3475; furnishing del. f.o.b. cars shipping point or f.o.b. cars Walt Siding, distribution board and bus ducts, distr. transformer disconnecting switches, transformers, regulator, battery charger, for Pole Hill Power Plant, Colorado-Big Thompson Proj. Spec. DS-3465. L. N. McClellan, ch. engr.

Ill., Great Lakes—Dpt. Navy, Yards & Docks Annex, Arlington, Va., Naval Hospital, $3,900,000; electronics supply office, $4,053,100; naval training center, $6,295,000; naval supply depot, $3,750,000.

Missouri—Crawford Electric Co-operative, Bourbon, Mo., constr. addnl. 300 mi. rural distr. lines, extensions and other system imprvs. 2-way radio system, etc. $1,300,000. Birenbaum & Smith, 7510 Delmar Blvd., St. Louis 5, Mo., consult. engrs.

Montana—Bonneville Power Admin., 872 N. E. Oregon St., Portland, Ore., Inv. 5920, constr. Kalispell Sub-station addns. Plans deposit $25. L. C. Stewart, c/o owner, engr.

Nebraska — Panhandle Rural Electric Membership Assn., Alliance, rural distr. lines Box Butte, Sioux, Morrill, Sheridan, Garden, Grant, Cherry, Arthur and McPherson Counties, $550,000. Raymond H. Reed & Co., Columbus, Neb., consult. engrs.

N. M., Los Alamos—U. S. Atomic Energy Comn., Los Alamos, plans by Ralph M. Parsons Co., 617 S. Olive St., Los Angeles, Calif., part of a laboratory bldg., approx. 28x186 ft., mono. concrete, 1 story partial bsmnt., incl. clearing, grading, paving, site imprvs. and utilities, Inv. 291-52-1. $550,000-$650,000.

N. Y., New York—A. B. C. Television Center Co., Inc., 30 Rockefeller Plaza, Zone 20, plans by Carson & Lundin, 50 Rockefeller Plaza, Zone 20, storage, garage shops bldg., alterations, 2040-2052 Broadway, $100,000; convert storage warehouse at 39-41 W. 66 St. into TV and broadcasting studio bldg., $610,000.

N. C., McCain—North Carolina Sanatorium, McCain, power plant imprvs. Bernard Crocker, Jr. Lawyers Bldg., Raleigh, engr.

North Dakota — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., one 300 kva, one 112.5 kva. and one 100 kva. transformers, six 15,000 volt and two 6,000 volt discon-

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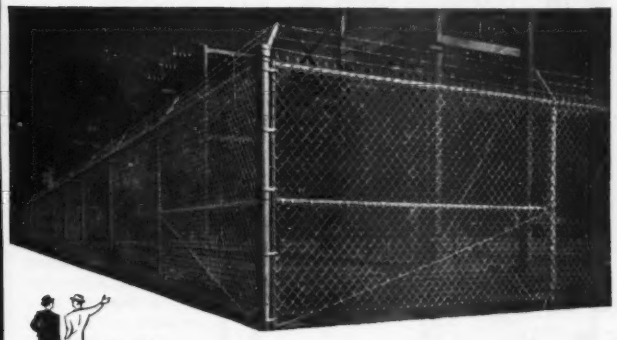

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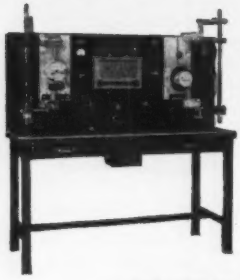

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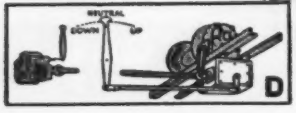

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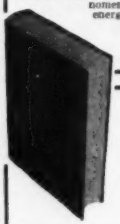

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necting fuses for Bismarck, Jamestown and Devils Lake sub-stations, Missouri River Basin Proj., Transmission Div. Spec. DS-3477.

Ohio, Cleveland—Ohio Electric Mfg. Co., 5902 Maurice Ave., 35,000 sq. ft. plant for mfg. of lifting magnets. $400,000.

South Dakota—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., 4 main control boards for Huron, Mt. Vernon, Sioux Falls and Watertown sub-stations, Missouri River Basin Proj., Transmission Div., Spec. DS 3472.

Wisconsin—Vernon Electric Co-operative, Westby, 40 mi. rural distr. line and sys. imprvs., Vernon Co. $360,000.

Wyoming—Bureau Reclamation, Dpt. Interior, P. O. Box 280, Casper, constr. Sinclair Sub-station, Transmission Div., Missouri River Basin Proj. Spec. 703C-202.

Low Bidders & Contracts Awarded

Iowa—Howard C. Draper, Mankato, Minn. Contract Awarded. $296,982. Carrier current equipment, installation, sub-station work, 13 sub-stations, Corn Belt Power Co-operative, Humboldt, Ia. Bids May 29.

Ky., Ezel—Mountain Rural Telephone Co-operative, Owner Builds. Approx. $415,000. telephone lines.

South Carolina—Roy Richards, Carrollton, Ga., Contract Awarded, $690,170, Proj. No. TV-A***Sumter Builders, Sumter, S. C., $568,242, Proj. IV-B, rural distr. lines, Central Electric Power Assn., Columbia, S. C.

South Dakota—Donovan-Lovering-Boyle Co., 2480 N. Elston St., Chicago, Ill. Low Bidder. $12,955,566. Power House for Fort Randall Reservoir Project, Inv. 25-066-51-102. U. S. Eng., 1709 Jackson St., Omaha 2, Neb. Bids June 14.

Tenn., McMinnville—Columbia Constr. Co., Columbia, Tenn. Contract Awarded. $199,876. warehouse and office for Electric Dept. City McMinnville, Tenn. Bids June 21.

Tex., Bandera—Walco Engineering & Construction Co., 2408 E. 4 Pl., Tulsa, Okla. Low Bidder, $238,199, 50 mi. rural distr. lines, 24 and 69 kv single H frame structures, incl. sub-station, Bandera and Real Counties, City, Bandera, Tex., Bids June 25.

Wyoming—McClellan & MacQueen, Inc., and Van Dike Co., Worland, Wyo. Low Bidder, $109,820 est. $104,081. constr. 10,000-kva Lovell sub-station, Missouri River Basin Proj., Spec. DC-3439, Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. Bids June 26.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ark., Little Rock—University of Arkansas School of Medicine, Little Rock, 400-bed teaching hospital. Plans deposit $100. Extended date. Erhart, Eichenbaum & Rauch, Wallace Bldg., Little Rock, Ark., archts.

Kan., Salina—Defense Dpt., U. S. Eng., Davidson Bldg., Kansas City 8, Mo., Smoky Hill Air Base, airfield pavements, facilities for fuel storage, communications, navigation lighting, operations, maintenance, troop training family housing, utilities, storage, shops, administration etc. $24,365,000.

Mich., Grand Blanc—General Motors Corp., Fisher Body Div., General Motors Bldg., Detroit, 486,240 sq. ft. factory, $10,000,000.

Mich., St. Louis—Michigan Chemical Co., Roland P. Place, pres., St. Louis, 1 story rein.-con. chlorine plant. $32,000,000.

N. Y., Brooklyn—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, plans by Andrew J. Thomas, 153 E. 38 St., New York, Zone 16, 11 story hospital, 2601-71 Ocean Parkway, HO-12, Coney Island Hospital. $12,000,000.

Low Bidders & Contracts Awarded

Mass., North Grafton—Gilbane Building Co., 90 Calverly St., Providence, R. I., Contract Awarded, Approx. $50,000. hydraulic die press forging plant for Dpt. Air Force, Worcester, Mass. Wyman-Gordon Co., 105 Madison St., Worcester, Mass.

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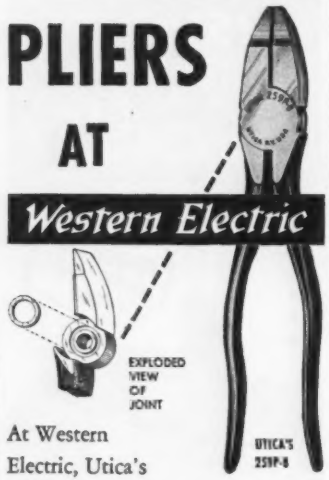

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BOOK REVIEWS

Television

Elements of Television Systems. **By George E. Anner. Published by Prentice-Hall, Inc., New York 11. 804 pages, illustrated. Price $10.35.**

Television here is first divorced from radio so that the problems of picture reproduction can be focussed without the complications of the transmitting link. A cable is assumed while the principles of televising are developed in quantitative detail. Later, after dealing with scanning methods and the circuitry of scanning generators, camera tubes, and the necessary video amplification, the radio link is injected along with synchronization and reception and antenna systems. Closing discussion bears on the technology of color television. Throughout, the author has striven to stress the practical significance of the techniques and control of television.

Insulation

Electrical Insulation: Its Application to Shipboard Electrical Equipment. **By Graham L. Moses. Published by McGraw-Hill Book Co, Inc, New York 18. 259 pages, illustrated. Price $7.50.**

Information about insulating materials here is comprehensive and well-organized from basic principles and properties to installation and maintenance in equipment. Insulants are classified, properties detailed, appropriate applications cited, limitations acknowledged, and various standards identified. In fact, the treatment is far more that of a handbook than a text book and the scope is broad enough to have pertinence in an activity where electrical equipment is used.

Arc Welding

New Lessons in Arc Welding. **The Lincoln Electric Co, Cleveland, Ohio. 320 pages, illustrated. Price $1 in U. S., $1.50 elsewhere.**

The lessons are practical, not theoretical, and cover fully basic fundamentals of arc welding as well as more advanced welding of alloys, sheet metal and pipe. The basic 32 lessons cover welding mild steel in all positions and 29 advanced lessons cover other welding applications. Practice materials, exercises, questions and answers are given for each lesson. Practical information contained in a 163 page welding application section will help welding operators advance in knowledge and skill after fundamentals have been mastered. Explained are: (a) latest welding procedures for faster and lowest cost welding; (b) automatic and semi-automatic hidden arc welding procedures; (c) how metals are made and how to identify them; (d) how to select correct welding joints; (e) how to make common machine parts to use welding instead of casting.

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AIEE Summer Meeting

(*Continued from page* 107)

Bulk of the discussion at the Tuesday morning hydroelectric system session centered around the Laffoon, Whitney, and Baudry paper on trends in vertical waterwheel generator design. J. E. Tillman, General Electric, noted that the umbrella design of the machine, described by the authors, had the disadvantage of a longer shaft below the rotor. He questioned the wisdom of completely eliminating the upper guide bearing in such machines. The use of alloy steel in preference to cast iron for thrust bearing runners was also a mistake, he said. In a similar vein, H. R. Sells, Canadian General Electric, observed that the trend to umbrella type design was by no means uniform and that it solved some problems at the cost of introducing others of equal seriousness. He observed that two bearing machines can be more easily dismantled than the single thrust bearing units and that they require less concrete work in the substructure. P. A, Dandeno reported that Hydro-Electric Power Commission of Ontario now has two machines in service equipped with the type of high speed excitation scheme described by the authors. Further installations are contemplated, he said, particularly where long lines connect the stations with their loads. Tests have demonstrated the contribution of the scheme to system steady state stability limits.

The 94% efficiency guarantee for four of the eight new units for the La Cave plant described in the Aeberli and Simpson paper drew expressions of extreme interest from several discussers. In closure the authors explained that this efficiency was given for a European design by a manufacturer interested in breaking into the American market in competition with machine efficiencies ranging around 90%. To date there has been no opportunity to test the efficiency of the machine.

H. F. Abbott, Beauharnois Light Heat and Water Co, described the planning and design of the new Beauharnois Powerhouse No. 2, now under construction, which will add 660,000 hp to this hydroelectric development northwest of Montreal. The addition will bring capacity of the plant to 1,400,000 hp when completed. In his conference paper, Abbott described some innovations in powerhouse No.

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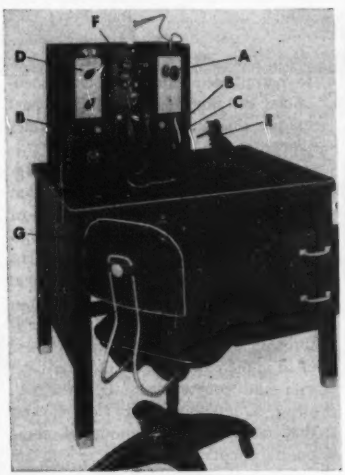

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Economic Primary Circuit Design Beneficially Studied By Unit System. D. K. Blake, *General Electric Co*

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The Linascope Transmission Line Fault Locator. K. H. Kidd, *Hydro-Electric Power Commission of Ontario*

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Current Carrying Capacity of ASCR Conductors. J. H. Waghorne and V. E. Ogorodnikov, *both of the Hydro-Electric Power Commission of Ontario*

Nomograms for determining current carrying capacities of ASCR conductors developed from Hutchings and Parr equation. One covers range of conductor sizes for range of wind velocity and ambient temperature. Simpler one applicable to one conductor size is suggested for operating use.

The Kidd paper on the Linascope fault locator at the Monday afternoon session on Distribution drew a lively barrage of informal questions from the floor centering mainly around details of operation. The author's responses established the fact that a 100-v radio-frequency pulse had been found more suitable than direct current for portable echo ranging equipment; that such a voltage is too low to permit detection of "leaky" insulators; and that the pulse will not pass readily through a power transformer tapped to the line.

Exception to statements of the Waghorne and Ogorodnikov paper, that ACSR conductor temperatures of 120 C brought serious deterioration in tensile strength, was taken by F. L. French, Aluminum Co of America. He said recent tests showed only a small loss of strength at this temperature but conceded that tension values cited in the paper, for 80 C, were both safe and conservative. L. M. Olmstead, Duquesne Light Co, showed that conventional methods of computing conductor capacity in still air give a higher value of current rating than that obtained at low wind velocities. This higher current rating, he said, may well be the limiting current that can be carried by conductor joints.

In a conference paper describing rural line design practices of the

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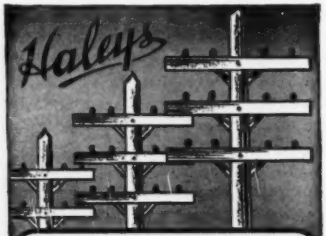

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Hydro-Electric Power Commission of Ontario, R. E. Jones said the Commission had abandoned use of side-tie in favor of top-tie insulators for bare wire as a result of vibration studies. From a fatigue standpoint, a long top-tie with armor tape or rods with pig-tail tie was desirable for spans up to 326 ft, Jones said. Buried rural primary cable had been used by the Commission as early as 25 years ago. However, for three-phase circuits it had been found too costly. Conversion of such cable to higher voltage or from single to three-phase operation was extremely expensive.

POWER GENERATION

Static Magnetic Exciter for Synchronous Alternators. By H. F. Storm, *General Electric*

Instability of high-gain regulation avoided, along with the antihunt means, to achieve 10.6 percent regulation; excitation increases in case of alternator short-circuit.

Differential movement of stator coils and iron in turbogenerators was reported in a conference paper by M. D. Ross, E. I. King, and M. M. Matthews, Westinghouse, which was addressed to evaluating the factors which had, in a few instances, caused migration of mica tape in asphalt-bonded coils. Tentative conclusions were (1) overloading causes rapidly increasing differential movements, about proportional to core length, with top coils exhibiting more insulation deterioration; and (2) coils bonded with synthetic resin are unaffected as to life by rapidity of loading. J. W. Jones, Philadelphia Electric, said limitation of rise is the way to avoid winding troubles of the older machines. D. W. Snell, General Electric, advised increase of hydrogen pressure as load increases.

G. L. Moses, Westinghouse, mentioned a recent paper devoted to the development of an insulation much less subject to migration under temperature changes in the machine.

Ontario Hydro-Electric Power Commission engineers F. K. Dalton and A. W. W. Cameron, in another conference paper, showed how it was possible to determine subtransient and negative sequence reactances without uncoupling the turbine from the alternator or even placing its windings in any specific angular position. Values are deduced from voltage and current readings taken with rotor short circuited and third stator terminals opened in succession.

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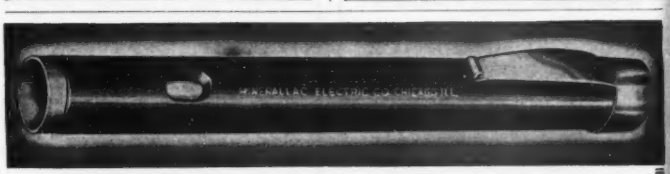

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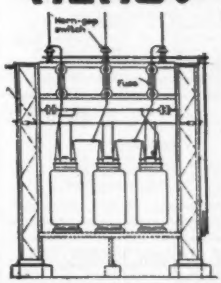

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SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, $1.20 a line an insertion.

INFORMATION:

BOX NUMBERS count as 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is $11.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by July 20th in the N. Y. C. office will appear in the July 30th issue subject to limitation of space available.

POSITION OPEN
ELECTRICAL ENGINEER

Under 45, for permanent supervisory position with California Public Utility. Excellent opportunity. Should have at least 5 years recent experience on electric utility system design and operation. Submit complete personal history and experience, including earning record, with letter of application. Salary open.

P-1125, Electrical World
68 Post St., San Francisco 4, Cal.

RADIO and COMMUNICATION ENGINEER

Unusual opportunity with large Consulting Firm in New York City for Electrical Engineer experienced in communication systems including telephone, radio broadcasting and ultra-high frequency microwave applications. A knowledge of communications as related to the electric and gas utility industry would be helpful. Please submit resume of experience and personal data to

P-9696, Electrical World
330 W. 42 St., New York 18, N. Y.

MAINTENANCE ENGINEER ELECTRICAL

Graduate electrical engineer with broad central station experience in electrical betterment and maintenance problems, including equipment tests, planning and scheduling preventive maintenance programs and repair of failed equipment. Familiarity with system operation also desirable. Headquarters with large consulting organization in New York with visits to operating utilities, mostly in Central and South America. Attractive salary and opportunity for right man. Write giving age and fullest detail of qualifications and experience.

P-1333, Electrical World
330 W. 42 St., New York 18, N. Y.

Brokers or Mfgrs Agents Wanted

Major manufacturer of well known agricultural chemicals, herbicides, hormones, etc. seeks live, reputable representatives, particularly in all Eastern territories from Maine to Florida. In first letter write lines now carried, trades covered, territories intensively travelled, other pertinent information. Address:

HARTOGENSIS ADV. CO.
722 Chestnut Street • St. Louis 1, Mo.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED: EXPERIENCED Man to supervise stringing large size A. C. S. R. on 460 miles of double and single circuit steel tower lines located in North and South Dakota. Conductor is 954,000 CM and 795,000 CM with two one-half inch high-strength steel static conductors. Write Hallett Construction Company, Attention Harold R. Brown, Crosby, Minnesota.

ELECTRICAL ENGINEER wanted. Chief System Engineer for system having 1,000 miles of 66 KV transmission line and steam generating plant. Write 902 Amicable Building, Waco, Texas giving experience record and references.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $25,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

CONSULTING ENGINEER with 20 years experience in the utility field desires responsible position with operating electric utility either in management or engineering. Experience includes all phases of design, operation, accounting methods, valuation and rate analysis. Details gladly furnished upon request. Write PW-1122, Electrical World.

MECHANICAL ENGINEER: 30; M.M.E.; N. Y. registration; 10 years thorough industrial and central station steam power experience, expansion studies, design, test, installation, etc. Desires position as assistant to utility executive. Interested in top level utility engineering and economic problems. Present salary $8400. Box PW-1322, Electrical World.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3480) will be received by the Bureau of Reclamation, Denver, Colorado, until August 14, 1951, and then publicly opened for furnishing motor control and distribution switchboards, motor starters, and float switches for various pumping plants in Southern San Joaquin Municipal Utility District, Central Valley Project, California. Delivery is desired within 150 days. For particulars, address Bureau of Reclamation, Building 1-A, Denver Federal Center, Denver, Colorado.

SCHOOLS

Electrical Meter Engineering
"The Profession With a Future"
Meter Department demands are bringing good opportunities to meter experts.
HOME STUDY COURSE
Practical up-to-date home study covers all phases of Meter Work
Write Today for Free Booklet
Fort Wayne Correspondence School
Dept. 171, 201 Dime Bank Bldg., Fort Wayne 2, Ind.

Central Hudson Gas & Electric Corporation
Power Plant Technician

Man with at least high school education and with previous experience qualifying him to service instruments and automatic controls in modern steam power plant located near Newburgh, N. Y. Reply, giving qualifications and experience to:—

Employee Relations Office
Central Hudson Gas & Electric Corporation
South Road, Poughkeepsie, New York

FACTORY SEEKS CONTACT

FACTORY OF ELECTRO-TECHNICAL INSULATING COMPOUNDS IN HOLLAND,

with low production cost, well introduced in utility circles, exporting to European countries, wishes extension range of articles and seeks contact American manufacturing firm producing additional products such as insulating tape, insulating lacquer and other electro-technical insulating material. View collaboration on European Continent. Letters under W.Z.T. to

Nijgh & van Ditmar
Advertising Agency
Rotterdam, Holland

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered.

When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. Others do not receive the slightest indication that their letters have even been received, much less given any consideration. These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide.

We can guarantee that *Every Advertisement Printed in the Searchlight Section Is Duly Authorized.* Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Classified Advertising Division
McGRAW-HILL PUBLISHING COMPANY, INC.

"Put Yourself in the Place of the Other Fellow"

CAREER OPPORTUNITY FOR
ELECTRICAL ENGINEERS
Southern California

Our expanding workload presents many opportunities for advancement. Positions are open in the engineering and design of complete oil-refineries and chemical-plants.

Prefer men with a degree in Electrical Engineering. Experience should be in sub-station design, underground distribution, use of explosion-proof fittings, and industrial wiring.

Please send detailed summary of education, experience, and personal history to our Personnel Department. Also include a recent photo. All replies will be kept confidential.

C F BRAUN & CO
Engineers Fabricators Constructors Consultants
1000 South Fremont Avenue Alhambra, California

POSITIONS AVAILABLE
for
ELECTRICAL ENGINEERS
EXPERIENCED
and
RECENT GRADUATES

Whether you are a recent E. E. graduate looking for experience in a field where experience really counts or an established engineer in the field of TV and military transformer engineering and design, we offer you immediate placement at desirable jobs.

Numerous employee benefits
PLUS
the opportunity of working
with established experts
in this field.

Contact Personnel Director
STANDARD
TRANSFORMER CORPORATION
Elston, Kedzie and Addison
Chicago 18, Illinois

ENGINEERS
ELECTRICAL - MECHANICAL - STRUCTURAL

Openings in Ohio and New York offices offering long term employment with good salary for qualified Group Leaders, Designers and Draftsmen experienced in one or more of the following phases of industrial plant design:

Electrical	**Power, lighting layouts and electrical controls.**
Mechanical	**Plant layout, process piping, conveyors, heating and ventilation, boiler houses, process equipment layout, refrigeration, plumbing, tanks and vessels, packaging equipment, special machinery and equipment.**
Structural	**Structural steel and reinforced concrete.**

Please submit complete resume stating experience, education, salary required and availability date.

THE H. K. FERGUSON COMPANY
Engineers and Builders
The Ferguson Bldg. 1783 E. 11th St. Cleveland 14, Ohio
19 Rector Street New York 6, N. Y.

ENGINEERING OPPORTUNITIES

For design and research engineers. M.E. or E.E. degree. Several openings requiring 2 to 10 yrs. experience. Will design or test electrical power and transmission and distribution equipment and tools. Design engineers must know manufacturing processes, metals. Prefer research engineers with some industrial testing or laboratory experience.

These are steady jobs with a long established company, working on our regular product lines. Pay commensurate with ability and experience. Modern plant and equipment. Midwest location. Good working and pleasant living conditions. Vacations, sick leave with pay, profit sharing, group insurance.

State age, experience, education, status in first letter. Replies confidential.

P-1153, Electrical World
520 No. Michigan Ave., Chicago 11, Ill.

GUARANTEED "REBUILT" POWER EQUIPMENT

HERE'S A PARTIAL LISTINGS OF OUR GIANT STOCK THAT COVERS UNITS OF EVERY SIZE AND DESCRIPTION

SQUIRREL CAGE MOTORS

3 Phase, 60 Cycle, 220 or 440 volts (*2200 volts or higher)

H.P.	MAKE	TYPE	SPEED
1000	*G.E.	K83475	1800
750	*G.E.	KT	720
500	*G.E.	PBG	1800
500	*Fr-Morse	HS	1200
400	*Cant (new)	NZ	1800
400	*Al-Ch	ARWW	900
300	*Westgh	CS	3600
300	G.E.	FT-550	1800
300	Al-Ch	AR	900
250	L-Allis	1445	720
250	Westgh	CS	600
150	G.E.	IK	1800
150	*Al-Ch	AW	1800
125	Westg (new)	CS504	3600
125	G.E. TEFC	K83205	1200
120	G.E. (new)	K8333	900
100	*G.E.	FT542Z	1800
100	U.S. (Vert)	CFU	1200
100	Westg	CS	1200
100	G.E. (new)	K8333	720
75	Westg	CS761	1800
75	G.E.	K885	1200
75	G.E.	K8333	720
75	*G.E.	IK	720
60	G.E. (new)	K4445	1800
60	G.E. (new)	A1004U	1200
60	Al-Ch	AR326F	514
60	U.S. (vert)	SCW	1200
50	Westg	CS574	1200

Hundreds of Smaller Motors!

SLIP RING MOTORS

Crane and Hoist Type
M1/48/220 or 440 Volt

H.P.	MAKE	TYPE	SPEED
75	Westgh.	C1758A	600
37	G.E.	HITC (TENV)	600
25	Westgh.	C1572	900
22	G.E.	ITC5009	1200
20	Westgh.	C1	900
15	G.E.	ITC5010-25 cy.	720
11	Westgh.	C1464	900
6½	H & M	425A (TENV)	1200
3	G.E.	MTC5160	1200

TURBINE SPECIAL

312 KVA Crocker-Wheeler AC Generator 3/60/240/480 volt, d/c to
375 HP Worthington-Moore Turbine, Simple Automatic, Non-Condensing, 425 PSI, 10 lbs. Exh., 100° F SH with Reduction Gear and Accessories

AC SYNCHRO-GENERATORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2000 volts or higher)

KVA	MAKE	TYPE	P.F.	Spd.
1500	G.E.	ATI	.8	900
1000	*Westgh.	803D	.8	900
250	Al-Ch (New)	IH	.8	720
150	El. Machy	EM	.8	720
112.5	*G.E.	ATB	.8	1200
110	Cr-Wh	103	.8	900

BALANCING SETS

24 KW 250 V. 270 A, Nsut. Boque, Type HC1, 125 v. Gen. BB, Compd'd. on Fabricated Steel Base, d/c
20 KW, 250 V, 160 A. Nsut. Crocker-Wheeler, Type 181, 125 V. Gen. 3 sl. bearings, close-coupled.

AIR COMPRESSORS

SIZE	MAKE	TYPE	DISPL.	PSI.
10 x10	Ing-R.	ERI	223	120
10 x8	Ing-R.	DRI	179	65
9 x9	Worth.	HB	215	150
9 x8	Ing-R.	ERI	145	150
8½x9	Worth.	HB	170	150
7 x7	Worth.	HB	122	150

AC SYNCHRONOUS MOTORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 Volts or Higher)

H.P.	MAKE	Type	P.F.	Speed
800	G.E.	TS984	1.0	1200
750	*Westgh.		.8	900
700	G.E.	TS	1.0	514
320	*A.C.	Dr Pf	1.0	720
300	Cr-Wh.	ENG	1.0	300
250	*A.C.	Dr Pf	.8	720
220	G.E.	ATI	1.0	600
200	El. Machy.	Ped	1.0	450
150	El. Machy.	EM	.8	720
150	*Westgh.		1.0	300
125	*El. Machy.	SYN	1.0	900
125	Cr-Wh.	1835	1.0	900
125	*G.E.	TS	1.0	277
115	El. Machy.	EM	1.0	240
100	Cr-Wh.	1305	.8	900

Phone Canal 6-2900 Today

CHICAGO *Electric Co.*

First Source for 41 Years

1324 W. Cermak Road • Chicago 8, Illinois

FOR SALE
COMPLETE
STEAM POWER PLANT

5—714 HP Combustion Engineering WATER TUBE BOILERS, with Ebasco Superheaters, Sturtevant High Pressure Economizers, Green Chain Grate Stokers, Hagan Combustion Controls, Copes Feed Water Regulators, Clarage Forced Draft Fans, with Hoppers, Automatic Coal Conveyors, Automatic Ash Conveyor, 36" x 24" Jeffrey Flex-Tooth Coal Crusher.

1—705 HP Stirling 4 dum BOILER with B&W U-type superheater.

1—10,000 KW Allis-Chalmers STEAM TURBINE.

1—7,500 KW Allis-Chalmers STEAM TURBINE.

1—7,500 KW General Electric STEAM TURBINE.

All with complete control equipment.
Send for complete Inventory in Denver.

MORSE BROS. MACHINERY COMPANY
2900 BRIGHTON BLVD.
BOX 1708
DENVER 1, COLORADO

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1—	4000	Al. Ch.	Condensing 300/250 I.S.P. 2300 v. 3/60 Exc. & Surface Cond.
3—	750	G.E.	Condensing — 425 lbs. 750 T.T. I.S.P. 440V. 3 ph. 60 cy.— Built 1944
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. &/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. &/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

	KVA	Make	Type	Volts	Speed
1—	5140	Whse.		2400/4150	600
1—	8000	Whse.		2400/4800	720

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	666.25 cy.	11000
1—	1500	G.E.	360	275	2200/4400
1—	1000	Whse.	900	600	4150
1—	1000	G.E.	930	260	4100/6900
1—	750	Whse.	900	275	2300/4150
2—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	G.E.	900	600	2300/4000
1—	400	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	250	G.E.	900	125	4150

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
2—	4000	G.E.	HT	3	22000x2300
3—	1250	G.E.	HVDDJ	1	6900x440
4—	500	G.E.	HDD	1	22850/12500x480
4—	333	G.E.	HKDD	1	13800/6900x280/480
6—	300	G.E.	HT	3	2400x240/480
8—	300	G.E.	HT	3	13800x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

FOR SALE

2—Late 2000 KW GE Turbo Generators

2—4000 HP Synchronous Motors—257RPM

1—Rotary Compressor 60000 CF/H @ 4#

1—IR Compressor 20,000 CF/H at 100#

1—Deaerating F.W. Heater 10,000#/hr.

Utility Equipment & Construction Co.
316 So. LaSalle Street, Chicago, Ill.

FOR SALE

1—Skinner Steam Engine Generator Set consisting of the following equipment:
a—15" x 18" Automatic Horizontal Skinner Steam Engine, No. 7556.
b—Direct connected Western Electric 125 KW A.C. Generator, type R, 28 CE, 3 phase, 60 cycle, 240 volt, 301 amp., 257 r.p.m. #43344 complete with exciter and control panel.

ALSO

1—No. 5A Automatic "Iron Fireman" serial No. CC 5711 equipped with three strand V-belt drive, less motor with blower.

1—No. 90 "Iron Fireman Junior" stoker serial No. 13097 complete, less motor.

PORCELAIN PRODUCTS, INC.
420 West Sandusky St. Findlay, Ohio

-TRANSFORMERS-

BOUGHT AND SOLD

We carry a large stock of transformers, and invite your inquiries.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes. *One Year Guarantee.*

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

WANTED
WATTHOUR METERS

Please specify quantity, sizes, condition, glass or metal covers, etc.

ATLANTIC ELECTRIC METER CORP.
214 E. 41 St., New York 17
Phone:
VAnderbilt 6-1955

FOR SALE

3—400 KW 750 KVA Diesel Electric Generator Sets (2—Ingersoll-Rand and 1—General Motors).

For further information address
SILAS MASON COMPANY
Pickstown, South Dakota

FOR SALE

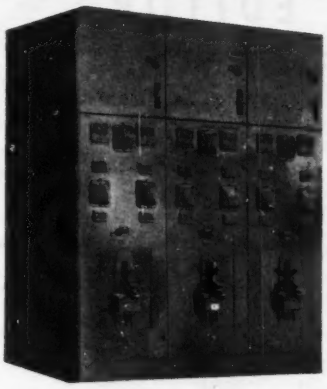
By the Village of Bethany, Illinois

One Fairbanks-Morse 6 Company, 3 phase, 60 cycle, 2300 volt, diesel electric generating unit, engine style V, No. 546084.

Sealed bids will be received by the Village on or before July 30, 1951.

WESTINGHOUSE SWITCHGEAR 7500 VOLTS

AVAILABLE IMMEDIATELY



15 Cubicles mounting:

F-124 OCB 600 A., gang operated Disconnecting Switches 600 A., CO Relays, Ammeter, Wattmeter, Watthour Meter

Indoor Oil Circuit Breakers

6 GE FK132B 400 A., 15 KV	1 GE FK46 600 A. 7.5 KV
12 Whse. F-22 400 A., 7.5 KV	7 GE FKR32C 600 A. 15 KV

Outdoor Oil Circuit Breakers

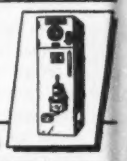
1 GE FHKO-236-2452 BF73	73 KV 400 A. 500 MVA
1 GE FHKO-139-42 BF 73-A	73 KV 600 A. 1,000 MVA
1 Condit FO-40-37C	37 KV 400 A. 750 MVA
2 GE FKO-136-2046-BS	50 KV 400 A. 280 MVA

All Used Equipment Reconditioned and Guaranteed

JOSEPH P. MANYPENNY CO.

Electrical Switch Gear

212 North 21st Street • Philadelphia 3, Pa. Tel. LO 7-2870



SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	7500	G.E.	138000-41000, 3 ph.
3	3333	West.	132000-7620/13200 Y
1	2000	G.E.	69300-13800/23900 Y, 3 ph.
3	1000	West.	66000-7200
3	500	G.E.	66000-2400
3	200	Mol.	44000/22000-440/220
3	75	G.E.	44000-2200/4600
3	8333	West.	43800-13900
6	150	G.E.	34500-4600/2300
2	7500	A.C.	33000-13200, 3 ph.
6	200	G.E.	33000-2300/6900
4	150	G.E.	33000-7200/12470
6	75	Mol.	33000/16500-2300/6900
3	75	Wag.	33000-7200/12470 Y
1	7500	G.E.	26400-617, Rectifier type
4	450	A.C.	25410/44000-13280/23000
3	333	G.E.	11000/22000-2400
3	200	Mol.	11000-2300
3	37½	Pitts.	6900-230/460
3	333	G.E.	4160-240/480
3	250	G.E.	4160-240/480
3	500	G.E.	4000-2300
3	200	A.C.	2400-120/240

INDUCTION REGULATORS

1—140 KVA G.E. 200 A. 4000 V. 3 ph.
3—46 KVA West. 200/400 A. 2300 V.
6—36 KVA G.E. 150 A. 2400 V.
2—36 KVA G.E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

4—600 A. 154 KV G.E. FHKO-39-2500 MVA
1—600 A. 132 KV G.E. FHKO-60-1500 MVA
2—600 A. 73 KV G.E. FHKO-139-1000 MVA
1—400 A. 73 KV G.E. FHKO-236-500 MVA
1—600 A. 37 KV G.E. FHKO-139-450 MVA
1—400 A. 37 KV G.E. FHKO-236-500 MVA
4—600 A. 15 KV G.E. FHKO-139-750 MVA

BREW, WOLTMAN & CO., INC.

52 Church Street New York 7, N. Y.

DIESEL POWER

FOR

IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	38TD10	2000	200	375	Enterprise	DSG-6	450	480
1420	Fairbanks Morse	38TD8½	1600	720	330	Superior	RNA	396	514
1260	General Motors	16-278A	1600	720	312	General Motors	6-268A	450	1200
987.5	General Motors	12-567	1060	720	312	Clark	MD-4	375	327
835	Alco	6-12½x13T	750	900	125	Ingersoll Rand	8	225	514
625	Baldwin	VO-6	510	450	187	General Motors	3-268A	180	1200
400	Buckeye	80	480	600	75	General Motors	6045C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.

ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2—400 KVA Pittsburgh, 1 Ph., 2400/4800-240/480 Scott-Taps.
1—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400V 220 Sec.
1—50 KVA G.E., 1 Ph., 2200V/6600V-220/440
1—50 KVA G.E., 1 Ph., 13,460V, 120/240 Sec.
1—25 KVA G.E., 1 Ph., 440/220, 220/110 Sec.

SYNCHRONOUS MOTORS

1—300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V. Totally Enclosed Fan Cooled Outdoor Service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V, 514 RPM, 4000V Syn.
1—200 KW Whse., 275V, 900 R.P.M., 220 V. Syn.
1—175 KVA West., 1 Ph., 220V Motor 3 Ph. 460V.
1—150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1—100 KW, Allis-Chalmers, 125/250V, 900 R.P.M., 480V Sc.

SLIP RING MOTORS

1—2500 HP G.E., MT. 257 RPM, 6600V.
1—250 HP West., CW, 900 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR

A Twenty Year Man Speaks

To the Editor:

The letter you published from the young engineer has inspired me to write of the viewpoint of the older man in the utility business. At the same time, I want to take this opportunity to thank you for your timely editorial reprimanding advertisers for their lack of courtesy in answering applications for jobs. It is indeed discouraging to keep looking and hoping for an answer, and then, all too often, not even receive an acknowledgment. After all, it takes a certain amount of time to prepare a well-written application and I agree with you that it is a simple enough matter to return the application with a notation "job filled," or similar answer. If a good photo is included, this is a matter of expense when a number of applications are sent out, the picture could be used if returned.

One of the most deadly practices in the utility business is the fairly consistent habit of job evaluation (so-called) that sets a fixed salary scale for certain jobs with no regard for the qualifications of the worker. The poor pay is indeed a fact, and the worst part of being a utility worker is that it, unlike industry, unfits a man for most any kind of other work.

The slow turnover in jobs in the utility industry is not due to the fact that the workers are happy or satisfied in their jobs. It is due primarily to a situation that should be rectified—the lack of a clearing house of some kind so that when an employee wanted to change jobs, he could find an opening. Have you ever noticed how few utility jobs are ever advertised? In other lines of work, if a man feels he is in a rut, he has only to scan trade journals to find openings, but not so in the utility industry.

For the older man, capable and experienced as his years of service qualify him to be, it is just about an impossibility to find a new job if for any reason he is unhappy. Even if he has over the years reconciled himself to the low pay, it is possible he finds himself working, for him, under intolerable conditions—such as being under the supervision of a man who delights in "riding" his employees whenever possible. The habit of bringing in men from the outside to fill any good positions that open up is also extremely disheartening, especially when those men are anything but exceptional.

"Twenty Years a Utility Man"

(Editor's Note: Electrical World departs from its policy of not publishing unsigned letters, in order to air the strong views of "A Twenty Year Man" regarding employment conditions.)

For Unstinting Cooperation

To the Editor:

May I congratulate you on the excellent article appearing in the June 4, 1951, issue of "Electrical World" describing the salient features of the Bonneville Power Administration's recent cable laying operation across Lopez Sound and Rosario Straits.

Your article mentions that the Administration rented the cable laying barge "Puget Power" from the Puget Sound Power & Light Co. While this was strictly a business arrangement between the Administration and the Company, I believe it is appropriate at this time to pay special tribute to the Company for its unstinting cooperation and technical assistance during the planning and designing phases of the project. Our thanks go particularly to Mr. L. E. Karrer, Executive Vice President of the Company, for authorizing the rental of the barge "Puget Power" and the assistance of his organization, to Mr. A. L. Pollard, Operating Manager of the Company, for supplying us with important background material; and to Mr. M. T. Crawford, Chief Engineer, whose experience and technical knowledge proved invaluable to our engineers and designers. We feel that Mr. Crawford is one of the foremost authorities in this field in the country.

S. E. Schultz
Chief Engineer
Bonneville Power Administration
Portland 8, Oregon

We Know Better

To the Editor:

Please be advised that on p 29, Sales Assignments column, June 11, 1951, issue of your publication under the sub-heading of Representatives, our Company name appeared as Ward Electric Co's which is in error and should have been correctly stated as Ward Leonard Electric Co's.

H. F. Littlejohn, Jr
Publicity Director
Ward Leonard Electric Co
Mount Vernon, N. Y.

(Editor's Note: We apologize for the mis-use of an old and familiar name in the electrical industry.)

New Words for Capitalism

To the Editor:

I was interested in your editorial in the June 4th issue, "A New Word For Capitalism."

For many years I have been making talks before various and sundry groups explaining and defending the free enterprise or capitalistic system.

About five years ago I adopted a new term "The American Enterprise System" and have found it to be very effective.

"The American Enterprise System is the finest system ever devised by the brain of man for producing things for human progress and happiness."

No other system ever developed anywhere can be compared with it.

H. M. Pace
Vice President
South Carolina Electric & Gas Co
Charleston, S. C.

Industrial Briefs

To the Editor:

It appears from some of the comments that we have received from our customers that the Industrial Briefs are quite popular. We certainly think they are well worth while.

G. R. Black
Supt. of Industrial Sales
Wisconsin Electric Power Company
231 West Michigan Street
Milwaukee 1, Wisconsin

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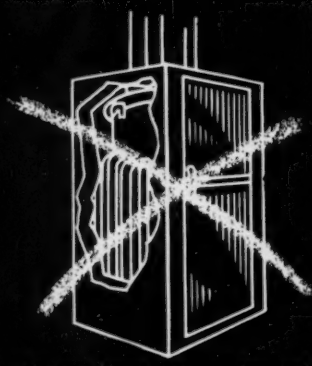

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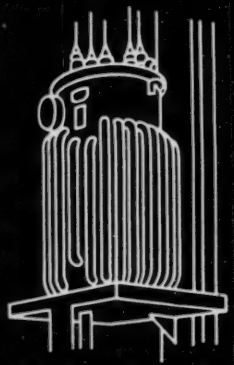

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